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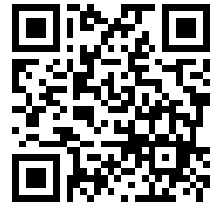

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VOL. LI.

JULY TO DECEMBER,

1922.

LONDON:
33, TOTHILL STREET, WESTMINSTER, S.W.1.

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44-47, ST. MARTIN'S LANE, W.C. 2.

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Derby, 1922.

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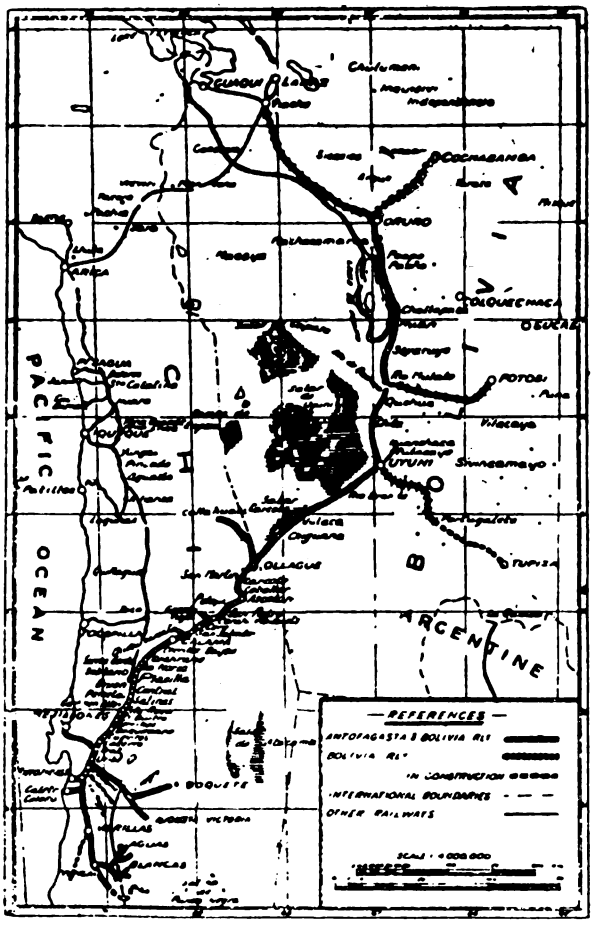

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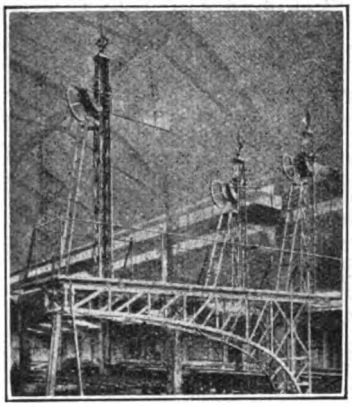

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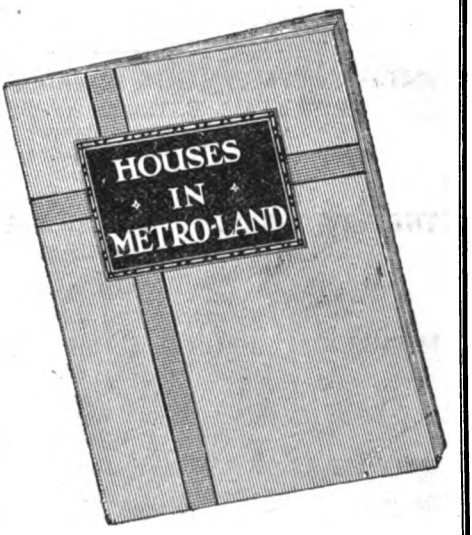

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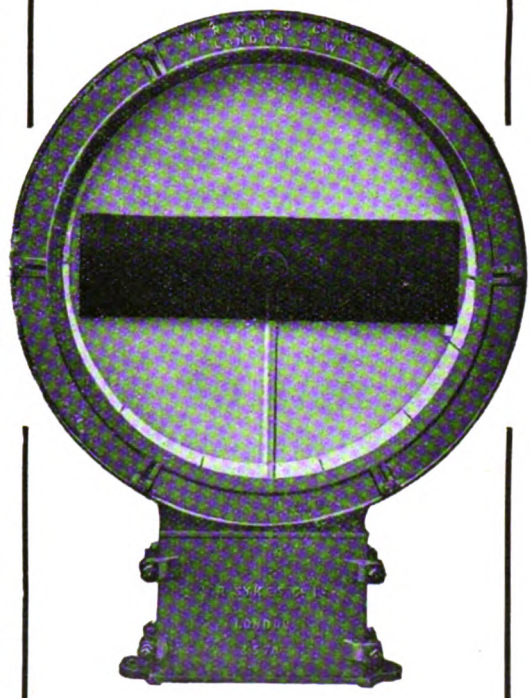

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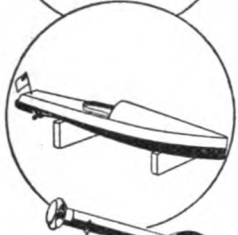

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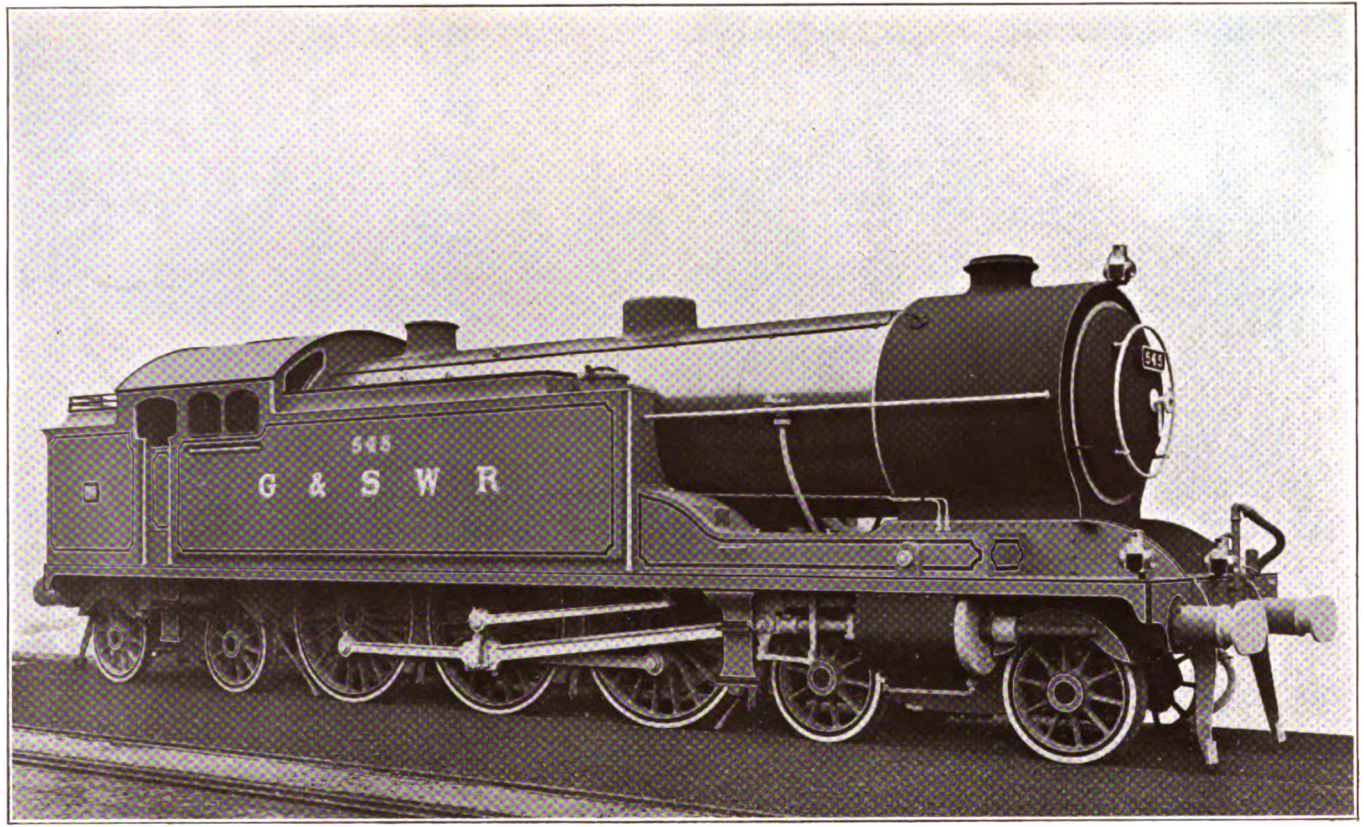

THE RAILWAY MAGAZINE.

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Photo.] [*F. E. Mackay.*

DOWN LIVERPOOL AND MANCHESTER EXPRESS, LONDON & NORTH WESTERN RAILWAY.

4–6–0 four-cylinder locomotive No. 85.

The North-Western and Midland Alliance.

SOME POSSIBILITIES OF THE LONDON AND NORTH WESTERN, MIDLAND AND LANCASHIRE AND YORKSHIRE GROUP.

By BASIL M. BAZLEY ("Basil Mercer.")

IN the excitement caused by the launching of the Geddes grouping scheme it was forgotten by many people that three of our greatest railways—the London and North Western, Midland, and Lancashire and Yorkshire—were already working in such close harmony that this particular group may be said to date from considerably before the war; that is to say, these three companies were eliminating the less important competitive services, introducing many economies, and providing a better service for the commercial needs of the country, long before any inspiration from the Government broke upon a somewhat muddled world. Before going any further, it may be well to glance at the extent of these three systems and at the districts served by them; according to the figures in that invaluable publication, the RAILWAY YEAR BOOK, the total mileage amounts to nearly 7,000 miles (this omits the Caledonian and other lines which are also to go into the North Western "group"); it includes the first, second and fifth companies in order of net receipts; and it links up the most important industrial areas and big centres of population, together with a scarcely less imposing array of holiday grounds. The Midland and London and North Western Railways a number of years ago entered into a working agreement, and both companies were in a state of intimate relationship with the Lancashire and Yorkshire. Many developments were foreshadowed, some of which matured, but still more were held up by the inevitable consequences of the war.

For some time past many useful through services have been in operation; one of the best known, in the North of England at all events, was the working of the London

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and North Western Scotch trains from Liverpool and Manchester; these, instead of using the longer "all North Western" route, were diverted to the Lancashire and Yorkshire system at Preston. Then there were the excellent facilities provided by both of the larger partners in the group between London and the South Yorkshire and East Lancashire towns. There was also a splendid example of co-operation in the through trains from Leeds (Midland) to Keswick, over the Ingleton and Low Gill line (once known as the "Little North Western"). Last, but not least, we must remember the Lancashire and Bournemouth services, the trains in this case being handed over by the North Western to the Midland at Birmingham (New Street); this route, connecting the industrial north with the "Smiling South-West," by means of the Somerset and Dorset and London and South Western Railways, is to provide yet another facility this summer in the shape of through carriages from Manchester to Swanage. Before passing on to particular instances it may be noted that these through trains, especially when composed of corridor stock and restaurant cars, are an undoubted boon to the tourist, particularly to the man with many "olive branches"; even if the journey is no quicker than one which includes a crossing of London, the convenience and certainty are distinct gains—there is no fear of missing connections, that bugbear of the traveller who has to find his own way from one terminus to another in the middle of his journey.

Perhaps the most prominent and successful example of a through train which had for its object the elimination of the troubles and fatigues of getting across London was the "Sunny South" express of the London and North Western Railway; this train, of corridor coaches and with restaurant car attached from the northern to the southern limits of its journey, was extremely popular and useful; it connected Liverpool, Manchester and Birmingham with Brighton and Eastbourne, travelling over the West London line from Willesden to Clapham Junction; its functions were further extended by through coaches being attached for the South Eastern and Chatham stations, these latter working independently from Willesden to Herne Hill. One was very glad to see this service restored after the war period; it is to have an extended career of

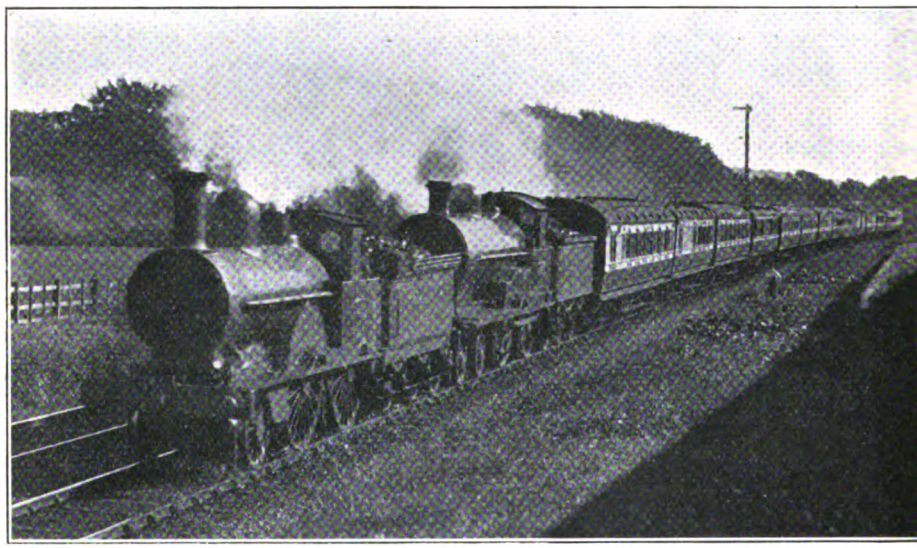

Photo.] [*F. E. Mackay.*

10 A.M. ANGLO-SCOTTISH EXPRESS ex EUSTON, LONDON & NORTH WESTERN RAILWAY.

Locomotives: 2-4-0 No. 1488, "Murdoch" and 4-4-0 No. 1680, "Loyalty."

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usefulness, particularly with regard to the South Eastern and Chatham Railway. The South of England has so many attractions for the holiday-maker that we can easily see that the north-countryman would willingly visit those parts; the transhipment of himself and family, with more or less luggage, across the metropolis often deterred a good many—until they found that the journey was no more trouble than a visit to Scotland or North Wales.

For its connections with the southern companies the Midland is less happily placed than its partner at Euston Square; ward over the North Western main line, a distance of 102 miles. We must, however, deduct five miles from this, for Willesden would be the goal and not London. By this means through trains could be worked from the Midland centres —Leeds, Bradford, Derby and Nottingham—on to the Brighton line as well as the other two southern companies. This is no suggestion to close St. Pancras; that station will have no lack of business in the near future, and to send trains from big cities like Leeds into Euston would probably not be welcomed by any one

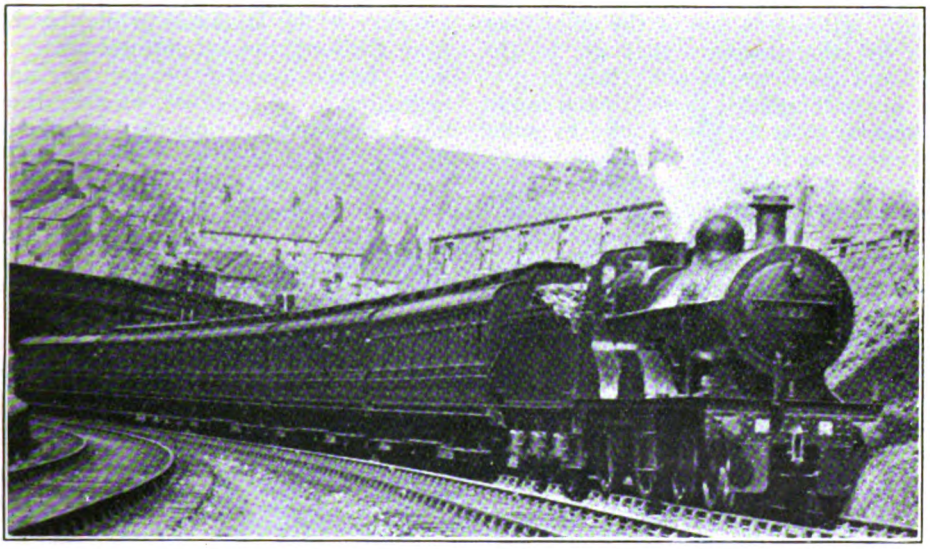

Photo.] [*R. D. Pollard.*

MANCHESTER-CHINLEY TRAIN, MIDLAND RAILWAY, LEAVING NEW MILLS.

Rebuilt 4-4-0 locomotive No. 391.

the working over the loop via Gunnersbury to the London and South Western Railway was not expeditious; the South Eastern and Chatham line was reached by means of the "widened lines" of the Metropolitan Company, by no means an enjoyable route on account of the tunnels and one with severe gradients and loading gauge restrictions. Now, the distance from London to Leicester by the Midland is just over 99 miles; an equally suitable express route could be brought into being by using the Midland branch from Leicester to Rugby (this was once part of the through railway route between London and the North!), and continuing south- concerned in the difficult working of that busy terminus. In the case of the north to west through trains which are united at Birmingham it might be a relief, as my friend Mr. Cecil J. Allen suggested, to work these from the North Western on to the Midland's Camp Hill loop and hand over there; New Street station, in spite of its size, has about as many trains as it can deal with, and enlargement is practically impossible. Birmingham could be adequately served by the service from the Midland system to and from the south.

Another possible link, enabling through trains to avoid the London termini, is provided by the North London Railway; by

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this means excursions could be run from Birmingham to Southend, via Willesden, Camden, the straight line at Dalston Junction, Bow, Plaistow, and thence over the Tilbury section of the Midland. The latter company, too, might find it to their advantage to run through trains from Leicester and Nottingham, and even further afield, to the gay seaside town at the mouth of the Thames. Through trains have already been worked this way from Watford, so it would be an extension rather than an absolutely new service. There is another reason, perhaps even more important, for encouraging traffic over this route, from either companies' system. Tilbury is one of the chief liner ports for the steamers that go to the East, and great works are either in progress or contemplated there; much might be done to cater for this traffic by some good expresses from the two big railways, not forgetting the great number of large towns on the Lancashire and Yorkshire Railway. And it might be possible to give London a river service something like that provided for Glasgow by the Scotch railways on the estuary of the Clyde. In spite of the vast Atlantic liners which use Southampton, London is still the chief port of the kingdom; in addition to the long distance voyages there would be many shorter ones, such as those to Belgium and Holland, which could be conveniently dealt with at Tilbury.

Possibly because it is relatively near London in mileage, Northamptonshire has attracted little attention from the holiday-maker, yet it is on the whole well wooded and well watered, full of fine old churches ancient castles and wide sweeps of forest; it is one of the richest counties in England as regards historical associations and memorials of the past. The Midland and North Western have intersected the county with their lines, and it only requires a little booming and a slight increase in the railway services to turn it into a source of revenue. In making these suggestions I have practically confined myself to existing lines, but there is one piece of new construction which, if made, would be extremely useful; it is possible at Northampton to run a train from the Midland station on to the North Western line to Wellingborough and Peterborough; a small and easily constructed spur would render it possible to work trains from the Midland Bedford-Northampton line into the North Western Company's Castle station at the latter town. If these were done we might see a very useful service from Cambridge (London and North Western) to Wolverhampton; the trains could travel over the North Western for the first part of the journey, running on to the Midland at Bedford, and returning to North Western metals at Northampton; it would be possible to serve Rugby, with its connections, Coventry and Birmingham; one might even see through coaches from Luton, a growing machine-making town, to the other centres of the motor industry in the Midlands, while the traffic from Bedford, the agricultural centre of a very fertile county, is by no means negligible. Yet another service, though not a long distance one, may be suggested in this district—from Northampton to Leicester and Nottingham, over the North Western as far as Market Harborough, where there is a convenient junction, and thence over the Midland.

In these days the Stratford-on-Avon and Midland Junction Railway looks very peaceful and appears to concern itself mainly with local business, but there is no reason why, in the near future, it should not justify the hopes of the most sanguine promoters of the old East and West Junction Railway and become an important link in cross-country travel; it will be fresh in the memories of many of my readers that a banana special was worked from Bristol over the Midland to Broom, thence via Stratford and Olney to Bedford, and so to London. Here again a little new construction would be necessary, but this would be of very slight character—merely the insertion of a direct junction at Blisworth, a short permanent way operation; a more ambitious scheme would be to make a burrowing loop under the main line to the Northampton branch. This district, with a convenient train service, would be an admirable tourist country, for, quite apart from "Shakespeare's Arden," the whole countryside is extremely beautiful and attractive. The Midland could run trains without any alterations or new works, from Birmingham and Bristol to the lovely Avon Valley; both companies could serve it from the north, while the North Western could

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provide the London connection. As a through route the S.M.J. might have a train from Northampton to Cheltenham, via Blisworth, Stratford and Broom; the service could even be extended to Bristol and Bath, and give a useful connection via Ashchurch to Tewkesbury and Malvern. The whole of this district—an exceedingly pretty country, too—would attract many sightseers; nearly every foot of it is historic ground.

We have already mentioned one important north to west route—that provided by both North Western and Midland Railways from Lancashire to Bournemouth; in addition to this, the Midland works a heavy express service over its own line from Bristol, Bath and the south-west to Birmingham, Derby, Sheffield, Leeds and Bradford; while the London and North Western joins with the Great Western in operating the very considerable traffic over the Shrewsbury and Hereford Joint Line, sometimes called the Severn Tunnel route. From Craven Arms on the joint line the Central Wales branch diverges, eventually reaching Swansea, this last not exactly a beauty spot, but it is a very important town commercially; on the way, however, is that famous district near the valley of the Wye where are grouped the "Four Welsh Spas"—Llanwrtyd, Llangammarch, Builth, and Llandrindod, each having the word "Wells" added to its name. There are many more attractive places on this line besides the above-mentioned spas; it should be quite easy to serve it from Leeds and the West Riding towns via Crewe (it already enjoys a night train), while there are two through coaches each way daily between Swansea and Liverpool and Manchester; it might even be a paying proposition to put on through coaches to the Central Wales line from Nottingham, Derby, Stoke-on-Trent, and Crewe, using the North Stafford line for this purpose. From Hereford, at the southern end of the joint line, the Midland have an exceedingly pretty branch that runs over the hills to Brecon; this is an almost unknown holiday ground, but through coaches from Lancashire and Yorkshire to the districts served by the Neath and Brecon and Brecon and Merthyr Railways might stimulate business in this direction. There is also the North Western's own country in South Wales; much of it is pretty and it serves a very important commercial country, but better facilities to and from the north of

Photo.] [*Henry L. Salmon.*

UP EAST LANCASHIRE EXPRESS, MIDLAND RAILWAY.

Compound 4-4-0 locomotive No. 1038.

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England would certainly induce traffic. While on the subject of north to west routes I might make mention of Leamington; this important centre deserves better connections with Liverpool and Manchester, and it could be given ample facilities from the big towns on the Midland system via Nuneaton and Leicester.

Turning to the East Coast of England—Poppyland or East Anglia—we see that the Midland is one of the partners in England's largest joint line, the Midland and Great Northern Joint Railway. A great deal of traffic passes over this line every summer, from Manchester and Birmingham to King's Lynn, Cromer, Norwich, Yarmouth and Lowestoft; here we might visualise extensions of the existing facilities; the Birmingham connection might serve Wolverhampton, possibly even Stafford, Wellington and Shrewsbury; it would also be quite feasible to run through vehicles from Liverpool to the Norfolk Coast via Stoke, Derby and Leicester. Bradford and its neighbouring towns are further away, but the citizens of those places might like to try this holiday ground if the journey were made comfortable by through carriages.

Through the thickly-populated Potteries district and between the London and North Western and the Midland territories runs the North Staffordshire Railway, a small but important line that links Stafford and Crewe on the former with Burton and Derby on the latter. When the two big lines were engaged in active competition it was idle to hope for anything in the shape of through trains over this route, but now that they are working together it would be possible and extremely useful to use the North Staffordshire Railway as part of a through route. The first and most obvious thing would be to give a through express service between Liverpool, Crewe, Stoke-on-Trent, Derby and Nottingham; trains on this route could pick up a lot of traffic, and the distance from Liverpool to Derby this way is actually five miles less than the direct Midland route via Chinley; there would be certain speed restrictions but on the other hand the total journey time might gain by the avoidance of the severe grades of the Peak. The use of the North Staffordshire line for something more extensive than mere local working presents many possibilities in the way of development; the service I have just outlined might be extended from Derby to Leicester and Cambridge on the south, and in a north-westerly direction from Crewe to Chester and the North Wales district; through trains are run between the North Stafford stations and Llandudno, so it would only mean a slight continuation of the service at the other end. There is another valuable line in this Staffordshire country, double all the way, which could be used for developing a new and very beautiful tourist region—it is known as the Churnet Valley line, from Macclesfield to Leek and Uttoxeter, thence to Burton and Derby. A little encouragement ought to induce the good folk of South Lancashire and the West Riding, also of Nottingham, to take a vacation in this lovely country; there is much to be seen—the beautiful Manifold Valley with its delightful narrow-gauge railway, the wonders of Alton Towers, and the charming Rudyard Lake after which, it is stated, our greatest living writer, Mr. Kipling, takes his first name, though he was actually born at Bombay. (It is very suitable to mention this author in an article on railway working, for he is almost the only writer of fiction who has succeeded in giving a realistic picture of the English railway service). While thinking of this part of the world I should like to suggest the restoration of the through service from London and the south to the Ashbourne-Buxton line; this serves a glorious piece of country, including the famous Dove Dale with its memories of Walton and Cotton and *The Compleat Angler*, but at present it is remarkably difficult to attain. The former route was via Nuneaton and Burton, a through coach being detached from a main line express at the former station.

In the South Lancashire district many things are possible, above all a greater use of the Riverside Station at Liverpool; by running trains direct to this station instead of to Lime Street the London and North Western Railway could give splendid connections, not merely to the Atlantic liners but to the many coasting and cross-channel boats which start from the landing stage, thus obviating the use of the curious road vehicles which ply between the steamers and the termini of Liverpool.

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By this means it should be possible to give a good service from London to the Isle of Man, and connections could also be made with the Belfast Steamship Company, the boats to Dublin and Drogheda, and the Scotch services of the Langland and Burns steamers. Trains could also be run from the Midland system to Riverside by using the spur at Hunt's Cross, where there is a very easy run-on to the North Western from the Cheshire Lines Committee. By using another section of this important joint railway the Midland could give an excellent service from Sheffield and Nottingham, with their huge populations, to North Wales via the Dore and Chinley line, Marple, Stockport (Teviot Dale), Altrincham, thence over the London and North Western to Arpley curve at Warrington, and so to Chester; this would be a much better and more convenient route than that via Buxton, it would be a good deal shorter and would serve larger centres of population.

The Lancashire and Yorkshire Railway runs through an immense number of important towns, and as this system is already very closely linked with both the North Western and the Midland, all that is needed in many cases is a simple extension or increase of the existing facilities. Southport gets a good service from London, but it has often occurred to me that that town and Blackpool could enjoy something more from places not on the Lancashire and Yorkshire line; Birmingham to both of these seaside resorts would be a very useful through service from the London and North Western system, while Nottingham and Sheffield on the Midland could be given coaches working via Manchester (Victoria). New tourist facilities might be created between Liverpool, Manchester and many other large towns on the Lancashire and Yorkshire, by giving trains to Bolton Abbey and Ilkley via Skipton (a junction which is all too little used), and by providing access from the East Lancashire towns to Matlock and the other delightful places on the Midland in Derbyshire; the North Wales resorts, too, might have better connections and through vehicles from the Lancashire and Yorkshire. Mention of Skipton suggests that it might turn out to be a better junction for the Midland trains from Manchester to Scotland to use than Hellifield; a train running this way could serve Bury, Accrington, Burnley, Nelson and Colne, all places of size and commercial im-

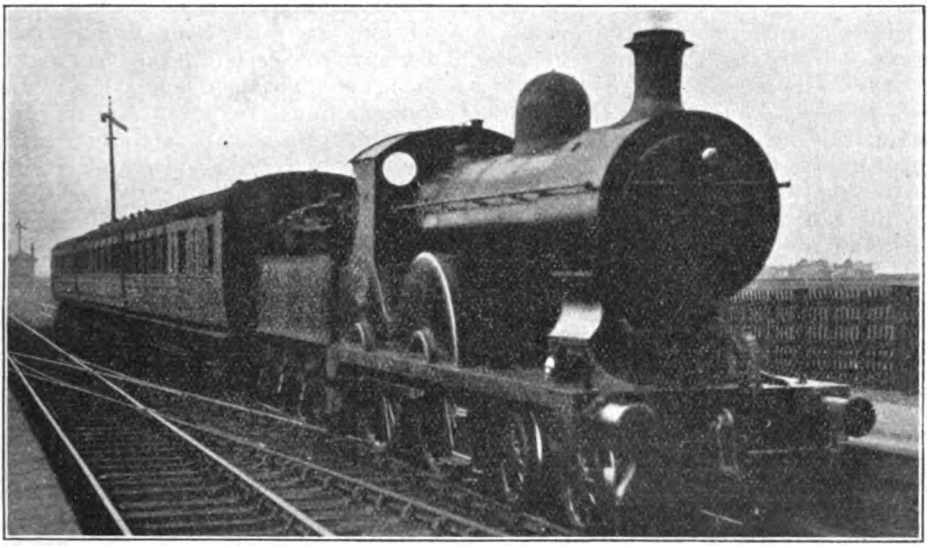

Photo.] [*Henry L. Salmon.*

SOUTHPORT-LIVERPOOL TRAIN NEAR ORMSKIRK.

4-4-0 locomotive No. 1110 (late Lancashire & Yorkshire section) London & North Western Railway

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portance. In thinking on the commercial side, rather than the purely tourist, though that is revenue-earning also, the happy position of Goole comes to mind; here for many years the Lancashire and Yorkshire have had a large fleet of steamers and a valuable merchandise traffic to and from the Continent. This port could be easily used for passengers, for it is splendidly connected with the lines of all three companies; a good service might be given from Scotland over the Midland route via Leeds and Methley. It should not be necessary to provide 25-knot turbine steamers; cheap fares would recompense many for the slower passage, while there are many people who would regard a longish sea trip as the most enjoyable part of their holiday—a good number travel between London and the East of Scotland by sea, in spite of the quicker competitive service by rail.

In the matter of the North of England both the North Western and Midland are well situated for dealing with tourist traffic to and from the Lake District, though it might be worth while to increase the facilities from the latter line to *La Suisse Anglaise* and also those from the Lancashire and Yorkshire. For the Scotch services I should like to make one very obvious suggestion: to run trains from the Midland to the Caledonian and from the North Western to the Glasgow and South Western. Sometimes the connections at Carlisle are good, say from the Midland to the Caledonian, but if that is the case those from the North Western to the Glasgow and South Western, must suffer, as the Citadel station will not permit of too many trains being dealt with at once. When we remember that the County palatine of Lancaster has a population larger than that of any other English county, including the County of London, and when we see from a map how close it is to Scotland compared with the Metropolis, it ought to be easy to work up a considerable business in the summer. There is again nothing very startlingly new in the idea, for the Stranraer boat train from Euston is handed over at the Border City to the Glasgow and South Western.

In making the above remarks I have not forgotten that the London and North Western and Lancashire and Yorkshire Railways are now one unit, but for the better understanding of the geographical situation I have spoken of them as if they still had separate entities; the fusion is so recent that many people still keep the two systems apart in their minds. There is one point of great importance in the working of long-distance through trains. I mentioned the necessity for forming these trains of corridor stock and providing adequate restaurant car facilities, but the all-over timing must not be allowed to become too long; this is very often not a question of competition, but it does have an effect on those people who consider how many hours of a hot summer day have to be spent in the train that takes them away for their holidays. While the through tourist express, and indeed any through train that covers any great mileage, should serve as many places of size *en route* as is conveniently possible, the timing in the long intermediate sections should be as good as can be managed. If these trains, whose real purpose is to provide communication between a place at one side of England with one on the other, be allowed to serve all sorts of minor roadside stations, the end-to-end time will become unduly lengthy and the tedium of the journey enormously increased.

Road competition is often mentioned in connection with holiday travel, but for distances of over 100 miles the superior speed, reliability and comfort of the train will always exercise a powerful influence, particularly to the family man or the passenger with luggage. The days when Englishmen made "The Grand Tour" are long past, but the idea still remains in many minds that if one travels extensively it must be abroad. To Englishmen their own country is often the least known of any, not because our country cannot show at least equal and in most cases superior attractions to the holiday-maker than most foreign lands but because they admit they "didn't think of it." If our cross-country routes are properly developed and the facilities advertised, there is no reason to suppose that travel at home will be regarded not merely as a part of education but as a necessary adjunct to the full enjoyment of life.

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Essex Coast Branches of the Great Eastern Railway.

By J. F. GAIRNS.

(Photographs by the Author.)

III.—THE HARWICH BRANCH.

(Continued from page 345, May 1922.)

BUILT as an early section of the Eastern Union Railway, this line is now associated in the minds of most people with Parkeston Quay and the Great Eastern Railway Continental services. Actually it is of considerable importance in other ways, and, as showing that its traffic is by no means insignificant, it boasts the dignity of local train services quite apart from the through trains and the ordinary branch services. Harwich—during the war an important Naval centre—is in ordinary times the scene of considerable shipping activity. The old town also has its holiday aspects, and the Great Eastern Railway Hotel is well worthy of commendation for week-end visits (inclusive terms are offered by the railway company), and as a touring centre. Barely a mile away, on the seaward side of the point of land on which Harwich stands, is Dovercourt Bay, a recognised holiday resort in considerable favour. Across the estuary of the Orwell is Felixstowe, and Great Eastern Railway motor boats ply to and fro on regular services, also to Shotley. Up the river Great Eastern Railway steamers go to Ipswich during the season, and the railway gives good access to many places of interest.

Manningtree, the junction for this branch, has terminal bays at the east ends of both through platforms, branch trains being usually placed on the outer lines for convenient transfer to and from main-line trains. There are also sidings for goods traffic. The junction is, however, triangular, there being also a double line from the branch northwards, joining the main line just before the viaduct over the River Stour is reached. Many goods trains reach the branch in this way, while this is the route taken by the Continental trains from and to Liverpool, Manchester, Birmingham, &c., by through trains to Doncaster and York, and by certain trains between Ipswich and Harwich.

Beyond the triangle the line follows the estuary of the Orwell, passing Mistley, Bradfield and Wrabness, until Parkeston Quay station is reached. Here are the berths for Continental steamers, close alongside the station, and extensive sidings, busy goods yards and other signs of industrial activity indicate to some extent the volume of the traffic here dealt with on the cargo side. Parkeston Quay station has a long down platform, of a somewhat unusual character, the western end, that nearest London, being alongside and available for use in connection with a loop in the down through line, and the eastern end of the platform for ordinary down trains in the usual way, with a bay terminal for local trains. There is thus room for two long trains, and one can reach or leave the eastward portion without interfering with a train standing at the westward section. The bay at the eastern end permits of local trains being dealt with even although the main platform is occupied by two Continental trains. Through down trains usually pass the westward portion away from the platform and proceed direct to the eastern section. There is also a short up platform for through trains, but occasionally trains from Harwich are run past and then back into the eastward portion of the main platform, for convenience of luggage transfer or for other reasons. An unusual feature is that public access to the station is obtained via a level crossing at the west end of the long platform. The main platform is well equipped with waiting rooms, booking halls for rail and steamer traffic, refreshment and dining rooms, and there are covered ways to the steamer berths

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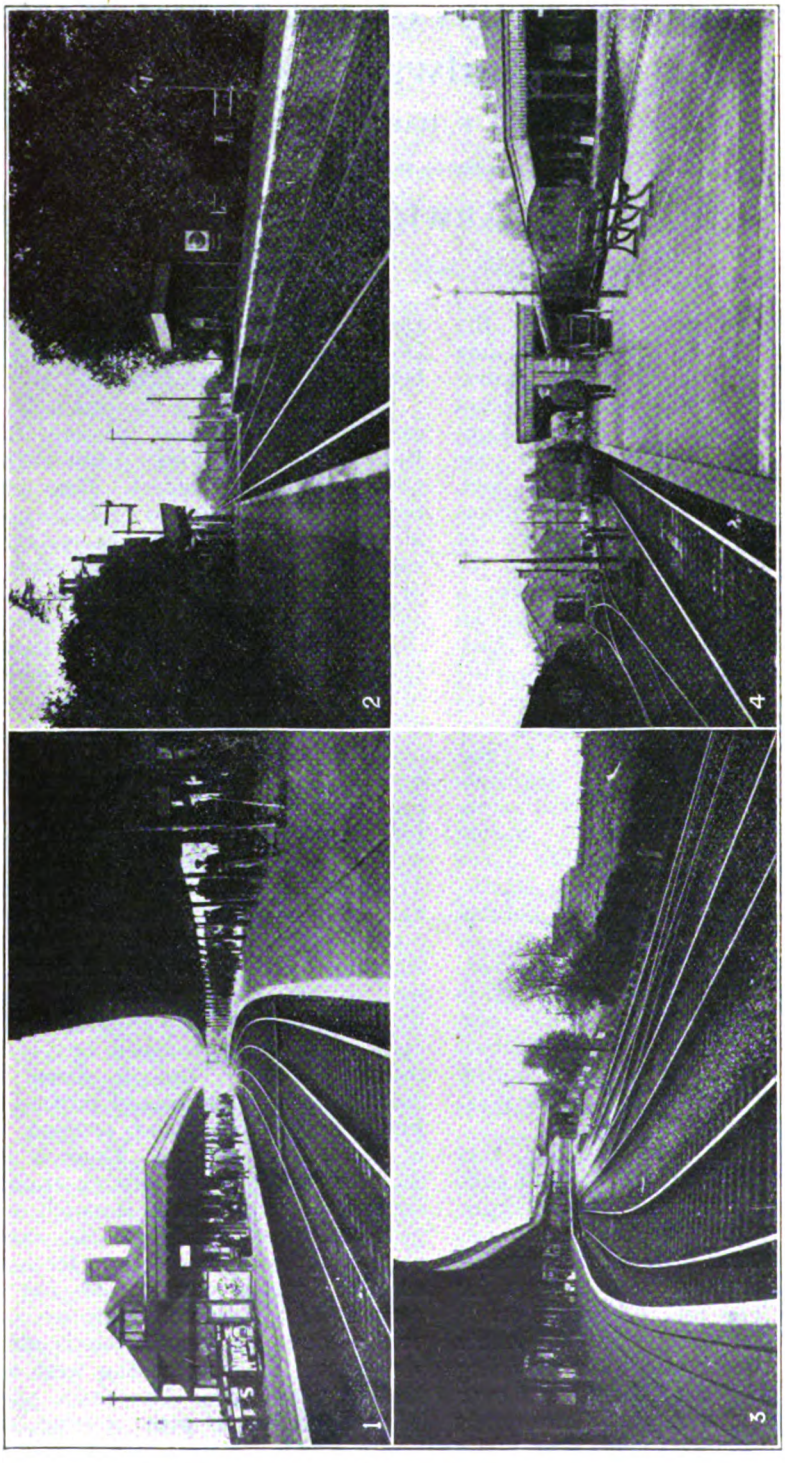

1.—Manningtree Junction. 2.—Bradfield.
3.—Parkeston Quay. 4.—Harwich Town.

STATIONS ON THE MANNINGTREE—HARWICH BRANCH, GREAT EASTERN RAILWAY.

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and direct connection with the railway company's hotel adjoining. The terminus at Harwich has one double-sided and one single terminal platform, with sidings and goods yard alongside, and a goods connection with the quay and dock lines.

Several ordinary trains convey through carriages for Harwich from London, but passengers usually require to change trains at Manningtree. There is, however, a plentiful service (important additions and accelerations will apply from July 10). The 5 a.m. makes the Harwich connection at Colchester at 6.43 a.m., and the 10.26 a.m. does the same thing at Colchester at 12 noon. The 6.54 and 8.46 trains from Liverpool Street connect with all-station trains from Manningtree at 9.30 and 11.2 a.m. respectively for Harwich. The 11.38 a.m. has a connection at 1.30 p.m. on Saturdays passing Bradfield and Wrabness, a stopping train following at 11.45 a.m. The 2.15, 3.20, 5.42 and 7.45 p.m. trains from London have all-station connections. The Harwich connection off the 3.20 p.m. leaves Colchester at 4.50 p.m., and Manningtree at 5.8 p.m. A through restaurant car train from York leaves Ipswich at 5.5 p.m. for Harwich, and serves all the intermediate stations on the branch from Mistley onwards.

In the opposite direction, ordinary branch trains leave Harwich at 7.5, 8.30, 8.46 (semi-fast), 9.55 a.m., 12.8, 12.45 (Saturdays only), 3.2, 5.27 and 7.50 p.m. for Manningtree, with a semi-fast at 4.23 p.m. The York restaurant car train leaves at 10.10 a.m., and passes Wrabness and Bradfield, calling at Mistley before taking the northern curve towards Ipswich.

It is, however, the Continental trains which call for principal attention. The first to arrive in the evening is that due at Parkeston Quay at 9.43 p.m., non-stop from Ipswich. This is a through restaurant car train from Liverpool and Manchester, via the Great Central and Great Eastern and Great Northern Joint Railways, with through carriages from Birmingham and Rugby (London & North Western Railway) via Peterborough and March. The train gives also a service from Ipswich at 9.8 p.m. It runs through to Harwich for terminal purposes. The next to arrive is the 8.30 p.m. Continental express from Liverpool Street, with first and second-class restaurant cars and first-class Pullman cars. This conveys only passengers for the Hook of Holland steamer, and terminates at Parkeston Quay at 9.52 p.m. At 10.12 p.m. the 8.40 p.m. from Liverpool Street arrives with passengers for the Antwerp and other steamers, with restaurant and Pullman cars for both classes. This train goes on to Harwich Town station, giving a late service from London for Dovercourt and Harwich.

The special boat trains in the opposite direction leave Parkeston Quay at 6.32 a.m., with Antwerp and other steamer passengers for London; at 7.50 a.m. the Hook of Holland passengers leave for London, due 9.33 a.m. These two trains do not run on Mondays. At 8.2 a.m. there is the restaurant car train for Liverpool and Manchester, Birmingham, &c., via Ipswich (due 8.32 a.m.).

Besides the trains mentioned there is also a service of local trains between Harwich and Parkeston Quay, these making frequent trips to and fro throughout the day.

On Sundays there are three services from London to Harwich, at 9.20 a.m., 4.40 and 7.40 p.m., and locals from Manningtree at 8.40, 11.15 a.m., 3.36, 6.12, 6.58 and 9.35 p.m., the last passing Bradfield and Wrabness. The two up Continental expresses for London run on Sundays, respectively, at 6.32 and 7.50 a.m.; a semi-fast branch train leaves Harwich at 8.0 a.m., and all-station trains—save that they do not call at Priory Halt—at 9.4 a.m., 4.54, 6.5, 7.15 and 8.45 p.m., all except the first and last two giving services to London. The Harwich-Parkeston locals also run on Sundays, with a good service, though not so frequent as on weekdays.

The boat expresses from London are, of course, worked by the "1500" class of superheater 4-6-0's, and 4-4-0's are used for the through York trains. Ordinary branch traffic is worked by 2-4-2 tank engines of the "1090" class, while the Harwich-Parkeston locals are generally taken by these or by 0-6-0 goods tender engines.

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IV.—THE KELVEDON, TIPTREE AND TOLLESBURY LIGHT RAILWAY.

This line, built under the Light Railways Act of 1896, and opened for traffic in 1904, was described in the November RAILWAY MAGAZINE of that year in an article by Mr. W. Parker. At that time, however, many of the works were still only partially completed, so that further reference to this little-known but interesting line will be in place, though no great changes have been made in the interim.

Its length is 8 miles 35 chains from Kelvedon to Tollesbury, the terminus for ordinary purposes, but an extension of 1 mile 43 chains gives direct connection with the pier, as required during the summer months, Tollesbury being another of the interesting yachting centres which have grown up among the inlets and by-waters of the Essex coast, Burnham, Maldon and Brightlingsea being the best known. The line is single throughout, controlled by train staff without tickets and by only one engine in steam (or two coupled together). As a light railway speed is restricted to 25 m.p.h., and several of the trains are "mixed," so that passengers occasionally are given the privilege at intermediate stations of being shunted to and fro with the wagons or of being left on the main line while the engine puts off, takes on, or shunts the goods wagons. At times this involves somewhat irritating waits, but the purpose of such a line is to meet the general requirements of the district served in as cheap and convenient a way as possible, and local residents and business people lay greater stress upon the value of the line to them than upon its speed characteristics, provided that it does not miss connections with main line trains at Kelvedon.

No station staff is provided except at one or two places where a porter is required to deal with the business side of the goods traffic. The passenger carriages, of which two or three generally suffice, are four-wheeled, with central passage-ways and folding gangways to enable the guard, who issues and collects tickets while travelling, to pass from one to the next. First-class tickets are not issued, the only differentiation being between smoking and non-smoking. On "mixed" services a shunter travels with the train, and at several places either he or the fireman has to alight to open and close level crossing gates, entailing stops in advance of and beyond the crossing for the purpose. The stations usually consist of a short platform with a small shelter or waiting room and an office for a porter. In several instances an old railway carriage body is thus utilised, and at one place the writer noted the body of a superannuated omnibus adapted in this way.

The Order of the Light Railways Commissioners permitting the line to be built was granted on January 29, 1901. Traffic was inaugurated on October 1, 1904. As the promoters, the Great Eastern Railway operate and maintain the line, which is under the supervision of the stationmaster at Kelvedon for staff and traffic purposes. As usual with such lines, no attempt was made to obtain easy gradients by expensive cuttings and embankments, so that it has a number of fairly steep sections of 1 in 50 and 1 in 70, while the curves are numerous and sharp. As the loads are not usually very great, however, one of the ordinary 0-6-0 tank engines of the Great Eastern Railway (No. 384 on the occasion of our visit with the leading coupling rods removed) is well able to cope with the heaviest demands.

At Kelvedon, although there is a rather steep transfer connection with the main line, traffic is dealt with at a low-level station adjoining and connected by a covered way with the main line station. Beyond the single platform is a small engine shed for the only engine employed.

Immediately on leaving Kelvedon station the line curves away to the right, shortly requiring a double stop, as already described, as the main road is crossed. Two private sidings (Brooklands and Heath) are passed, and the first station is reached at Inworth (2 miles 68 chains from Kelvedon). Here trains call only as required, and no staff is provided, but Tiptree (44 chains further on), as the most important intermediate station, a centre for fruit traffic, and where several works have been erected, requires a clerk

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in charge. Next is Tudwick Road siding, and at 4 miles 6 chains from Kelvedon is the conditional station of Tolleshunt Knights. At 5 miles 48 chains is Church siding, and at 6 miles 45 chains Tolleshunt D'Arcy station, the second most important intermediate station. At 7 miles 62 chains is Old Hall siding, and at 8 miles 35 chains the ordinary terminus at Tollesbury is reached. Tollesbury is a rather busy town of its kind, with several works, and the residence of a fair number of people concerned with local shipping, yachting and fishing. It is, too, in considerable favour with holiday makers who prefer a quiet unconventional place, while its yachting visitors are numerous in the summer months and at week-ends. The extension to Tollesbury Pier is used only during the summer and yachting periods. or occasionally for special traffic.

Points at intermediate stations have to be unlocked for use by means of the Annett's key combined with the train staff. Special regulations are in force to safeguard traffic on the public roads which are crossed, while cattle guards are fitted where cattle are liable to stray on to the line. As a rule, only a few wagons are conveyed by the mixed trains, and the one goods train each way daily is not usually a very heavy one, but the relatively extensive sidings at several places indicate that the line has caused the development of goods traffic on a considerable scale. There is only one overbridge, built for two lines in case it should be necessary to lay a second track here, and the railway is properly fenced, so that it is in no sense primitive, though the scale of construction is naturally not comparable with a railway built according to main line standards.

KELVEDON, TIPTREE AND TOLLESBURY LIGHT RAILWAY.

Mixed train entering Kelvedon (low level) station, Great Eastern Railway. 0-6-0 locomotive No. 384, with front sections of coupling rods removed.

Trains on this line connect with main line trains at Kelvedon, and, in the case of the most popular services to and from London, frequently convey considerable numbers of passengers, though on some journeys there may be few people travelling. Present arrangements provide for trains from Kelvedon at 9.25 and 12.29 and 5.54 p.m., returning from Tollesbury at 8.24 and 10.32 a.m., 3.15 and 6.42 p.m. The time taken for the journey ranges from 33 to 65 min., according to the allowances necessary for intermediate goods traffic.

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To the Continent by Calais or Boulogne.

By W. PARKER.

A COMMONPLACE remark during the last year or two of the great war was to the effect that the insularity of Great Britain had been broken. Perhaps it would have been more accurate to have said, "the insularity of the Briton," for while Great Britain still remains an island, tens of thousands of her sons, who never, had it not been for the great conflict, would have crossed the English Channel, or the narrow seas, are able to claim acquaintance with many a French and Belgian countryside, to say nothing of those who served farther afield in bloodstained Gallipoli, on the plains of Palestine, or in the enervating arid heat of Mesopotamia. To-day a dairyman in Dorset or a pedlar tramping the hills of Derbyshire, may be found able to converse with ease and accuracy concerning such foreign towns as Amiens, Cambrai, Lille, Roubaix, and numbers of other Continental places that before the war were not even known to them as spots upon the map.

There are other factors besides practical geographical knowledge that are constantly at work in maintaining in British minds the interest in the Continent that arose during the fateful years 1914–1918. One of these is the many acres of consecrated soil, where the fallen heroes lie, recently visited by H.M. King George, and another the friendships formed among the local inhabitants by the gallant men who survived the hostilities and lived to return to their old environments in their sea-girt homeland. These friendships form a non-political *entente cordiale*, by no means to be despised.

In spite, therefore, of the hardness of these post-war days of depressed trade and heavy taxation, when the means of so many people in the upper and middle sections of society are at ebb-tide, it is not surprising to find the powers that be on the South Eastern and Chatham Railway anticipate with confidence that during the summer season of 1922 there will be a passenger traffic at their Channel ports that will attain at least pre-war dimensions, if it does not surpass them.

To meet the requirements during the summer season various improvements were made, beginning on June 1. Thus the previous 8.30 a.m. service via Dover-Calais was transferred to the Folkestone-Boulogne route, and it now leaves Victoria station at 9.15 a.m. reaching Paris (Nord) at 4.35 p.m. an acceleration of 35 minutes over the previous service. An additional advantage of the transfer is that Londoners and others desirous of an outing to Boulogne can have a long day in that well-known French seaside resort.

The popular 2 p.m. service for business people has been retained, and it also runs on Sundays; this service is via Dover-Calais, reaching Paris (Nord) at 9.40 p.m. and it has a connection with Brussels, via Lille, due at Brussels (Nord) at 10.50 p.m., connecting there with the through service to Germany, Poland and the Baltic States. In connection with this service an express leaves Calais daily, via Laon, for Bâle, Interlaken and Coire. Although not strictly within the scope of the present writer's theme, it may be mentioned that a further South Eastern and Chatham Continental train alteration dating from June 1 last, is that the previous 8.30 a.m. service from London to Dover for Ostend was accelerated and timed to leave at 8.55 a.m. Then it had been rumoured that the Folkestone–Flushing service was to be removed from Folkestone, but the statement proved to be without foundation. What really happened was, it became a day service, leaving London at 8.30 a.m. This service enjoys comprehensive connections at Flushing with Cologne, Hamburg and Berlin by means of trains provided with through sleeping cars and corridor coaches.

But, *revenons à nos moutons*, the Calais and Boulogne routes to Continental Europe. The actual channel passages are Dover-Calais, 60 min.; Folkestone-Boulogne, 80 min. The new and accelerated summer services instituted on June 1,

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are run on Sundays as on week-days, and those to Paris are set forth on this page. It should be noted that as the 24-hours system for railway time now operates generally on the Continent, it is used in the times in the accompanying table :—

from Charing Cross and as the distance was 286 miles the average speed was 44 miles per hour. The war terminated this service.

Before the outbreak of hostilities in 1914 one service per day in each direction

Miles via B'l'gne	Miles via Calais	OUTWARDS.	1, 2 & 3 Class.		1 & 2 Class.		1, 2 (& 3*) Class.		1,2&3Cl.
—	—	Victoria (S.E. & C.R.) dep.	9Q 5	9 15	10 50	11 00	13 50	14 00	20 00
73	—	Folkestone Harbour arr.	10 45	11 00	..	..	..	..	..
		dep.	11A45						
—	77	Dover Marine arr.	..		12Q33	12 43	15Q37	15 43	21 55
		dep.	..		12A55		16B00		22A15
—	102	Calais Maritime arr.	..		14A10		17B30		..
		dep.	..		14 55		1 & 2 Class. 18 00		..
103	—	Boulogne Maritime arr.	12A45		..		..		23A55
			1 & 2Cl.	1,2&3Cl					
		dep.	13 27	13 40	..		..		0 50
262	287	PARIS (Nord) arr.	16 35	18 10	18 35		21 40		5§25

Miles via B'l'gne	Miles via Calais.	INWARDS.	1,2&3Cl	1 & 2Cl.	1 & 2 Cl.	1 & 2 Cl.	1,2&3Cl.
—	—	PARIS (Nord) .. .. dep.	7 10	8 40	12 00	15 45	23†55
159	—	Boulogne Maritime .. arr.	11 32	11 47	..	18 52	..
		dep.	12A10		..	1, 2 & 3 Cl. 19A10	..
—	185	Calais Maritime .. .. arr.	..		15 35	..	5 40
		dep.	..		16A00	..	6B15
—	210	Dover Marine .. .. arr.	13A45		17A15	..	7B45
		dep.	14 10		17 45	..	8 25
189	—	Folkestone Harbour .. arr.	..		..	20A45	..
		dep.	..		..	21 00	..
262	287	VICTORIA (S.E. & C.R.).. arr.	15 55		19 30	22 45	10 17

Turbine Steamers (S.E. & C.R.) in Services A, and French Paddle Vessels in Services B.
§ Passengers may remain in their seats until 7.00. Q—Runs when required.
* 3rd Class to Calais only.
† Train will be in Station at 22.00 ready for Passengers.

From the time-table it will be seen that the fastest rail and boat timing between London and Paris is seven hours. 'Twas not ever thus, as a brief history of the respective Boulogne and Calais routes will show, although in May, 1914, a new afternoon service via Dover and Calais was introduced to enable the traveller to accomplish the journey in six and a-half hours. This was by the 4.30 p.m. train used Victoria station, the other five trains each way were to and from Charing Cross. Now all the Continental boat trains start from or terminate at Victoria, and Charing Cross knows them no more.

Folkestone was first reached by the South Eastern Railway in 1844, the line being from London Bridge, via Croydon, Redhill and Tonbridge. In the same year the harbour was improved, and a movable

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railway bridge constructed, by means of which the inner and the outer basins were connected. In 1851 the Folkestone-Boulogne route came into prominent public notice. It was the year of the first Great International Exhibition held in Hyde Park, and the journey between Paris and London via Folkestone was reduced from 12½ to 11 hours. For this service the South Eastern Railway built 10 engines numbered 134 to 143 inclusive. They were of peculiar design, with intermediate crank axle and other improvements of T. R. Crampton, and were among the fastest of the locomotives of the day. One of them named the *Folkestone*, was on view at the Great Exhibition.

In 1864–66, the line from London Bridge was extended to Cannon Street and Charing Cross, and up to 1868 the distance from the latter London terminus to Folkestone was 84 miles. Then the direct line to Tonbridge via Chislehurst and Sevenoaks was opened and the journey to Folkestone Harbour shortened by about 13 miles. In those days the express day service was a tidal one. In fact it was not until 1885 that improvements effected in the harbours of Folkestone and Boulogne enabled the railway company to run boats between these ports during the daytime independently of the tides. In 1885 a fixed service between London and Paris was inaugurated. A train left London at 9.40 a.m. and the passengers reached the French capital at 5.57 p.m. In the reverse direction the train left Paris at 9.40 a.m. and travellers were due in London at 5.40 p.m. In 1897, the year in which the RAILWAY MAGAZINE made its first bow to the great railway public, the times in operation were departure from Charing Cross at 10 a.m. with arrival in Paris at 5.40 p.m.; and departure from Paris at 10.30 a.m. with arrival at Charing Cross at 5.50 p.m. The times and distances by the routes of 25 years ago are as below :—

Photo.] NEW CONTINENTAL BOAT TRAIN. [*F. E. Mackay.*

11 a.m. *ex* Victoria. Rebuilt 4-4-0 locomotive No. 19.

	Miles	Time. hr. min.	Miles per hr.
Charing Cross to Folkestone	72	1 40	43.20
Folkestone to Boulogne	29	1 30	19.33
Boulogne to Paris	158	3 27	45.80
Average speed the whole journey			39.14

June, 1, 1897, saw the establishment of a first and second-class afternoon service in both directions and the inauguration of a fast train between Boulogne and Brussels.

Of course, the great historic route, as Macaulay's erudite school-boy knows, is via Dover and Calais. In 1862 the boats

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plying between these two ports were taken over by the London, Chatham and Dover Railway. On the occasion of the Grand Prix, July 3, 1896, the Chatham and the Northern of France Railways accomplished a trip that beat all previous records. The journey from London (Victoria) to Paris (Nord) was performed in 6 hours 40 min., and this in spite of 16 min. lost through signal delays at Amiens and outside Paris. The loads by comparison with those of to-day were very light. Thus the English train of six coaches did not much exceed 75 tons, while that of the French train was nearly 95 tons. From London to Dover the speed averaged 57·5 m.p.h., and from Amiens to Paris 60·1 m.p.h.

In 1898 the service from London to Paris, via Dover and Calais, was :—

Leave London.	Arrive Paris.	Time of Transit. Hr. Min.
9 0 a.m.	5 0 p.m.	8 0
11 0 ,,	7 0 ,,	8 0
9 5 p.m.	5 38 ,,	8 23

On January 1, 1899, the London, Chatham and Dover Railway was by arrangement joined with the South Eastern Railway for united working under a Managing Committee, and the rolling-stock and steamboats of the two companies have since been worked as one concern. Following the amalgamation engineering work was put in hand for improving the physical connections of the two railways, and among them the western spur on the down side of the Chatham section at Bickley, finished in 1902, connecting that part of the system with the South Eastern line provided a new route for Continental boat trains.

Pullman cars were introduced in the Continental services of the South Eastern and Chatham Railway on March 21, 1910.

Photo.] [*E. A. Gurney-Smith.*

DOVER-VICTORIA UP CONTINENTAL PULLMAN CAR EXPRESS PASSING SHOREHAM (KENT).

Rebuilt 4-4-0 engine No. 179.

Throughout the Easter holidays of that year the demand for seats exceeded the number available, and demonstrated the appreciation of the travelling public. The 11 a.m. service from Victoria to Dover had to be run in two parts, and to each two Pullman cars were added. There were also two similar coaches on the 9.0 a.m. express from Charing Cross to Dover, and this arrangement was continued. On the day of the inaugural trip, Mr. H. Cosmo Bonsor, the Chairman of the Managing Committee, announced that if the public appreciated the new cars the directors were prepared to add to the

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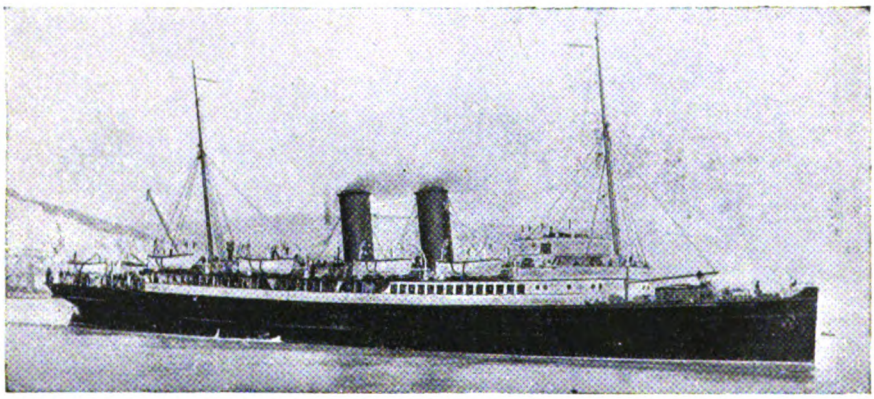
number, in order that they might form special trains and be used in express boat services other than between London and Dover. The company had not long to wait for the verdict of the travelling public, and on December 1, in the same year, Pullman cars were placed in service on the Folkestone Continental trains. Since the war the use of Pullman cars has been still further extended, and on June 16, 1919, they were introduced in Folkestone and Kent Coast expresses. To-day there are no fewer than 56 Pullman cars working on the South Eastern and Chatham Railway. Fifty are run on the Continental services as occasion requires. Some of them, of course, are not regularly on Continental boat trains, but there are no fixed allocations, so that whilst some



CROSS-CHANNEL TURBINE STEAMER "BIARRITZ."

are occasionally utilised on the Kent Coast services, they are all more or less used for Continental train working. With regard to the six cars that are not used on the Continental trains, these, Nos. 132-137 inclusive, are new buffet cars of a very high-class order intended for regular working on the Kent Coast services. In passing it may be recalled that the engine used on the inaugural Pullman trip on the South Eastern and Chatham Railway was Mr. Harry S. Wainwright's 4–4–0 locomotive, No. 516, first seen by the public in the Franco-British Exhibition at Shepherd's Bush in 1908.

In 1921 for the South Eastern and Chatham Continental boat expresses, a train of corridor stock was built at Ashford works to the designs of Mr. R. E. L. Maunsell, C.B.E , Chief Mechanical Engineer. This train was a departure from previous practice as until this innovation non-corridor stock had been used for the Continental boat trains. The carriages each measure 64 ft. over the gangways, and as they have been constructed to work in conjunction with Pullman cars the gangways are of Pullman type. Vehicles making up the train are: first-class, second-class, brake first-class and brake second-class. The stock is fitted with end vestibule doors only. All compartments are fitted with portable tables to enable passengers to be served with refreshments from the Pullman cars on the same train. There is electric bell communication between all the carriages and the Pullman cars. The new vehicles are painted outside with the company's standard brown, relieved by gold lines, bearing also the class number and the carriage number at the entrance to the vestibule doors, and the coat of arms of the Managing Committee at the centre. The new Continental train forming the 11 a.m. from Victoria is illustrated on page 16 from a photograph taken by F. E. Mackay, while the train was travelling at full speed hauled by rebuilt and superheated 4–4–0 locomotive No. 19.

Of the turbine steamers engaged in the Dover-Calais and Folkestone-Boulogne services the *Queen* was the first in 1903. Her success in the early days of her cross-channel service was so great that two others, the *Invicta* and the *Onward*—the mottoes of the two owning companies—were ordered. These were followed by the *Victoria*, the *Empress*, the *Riviera*

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the *Engadine*, the *Maid of Orleans*, and lastly by the *Biarritz*, a vessel that took her first service between Dover and Calais on Christmas Eve, 1921. Of the before-named nine steam turbine vessels seven are now working, the *Queen* and the *Onward* having been lost on war service. The latest addition, the *Biarritz*, had an adventurous career before entering upon cross-Channel work. When ready for service during the war she was taken by the Government and fitted as a mine-layer. When the Grand Fleet was ordered out, she was the first to get away. Afterwards ordered to the Mediterranean, she laid the mines which blew up the *Breslau*, and also mined the *Goeben*. The *Biarritz* is a twin-screw geared turbine vessel with a speed of 22½ knots per hour. Her tonnage is, gross 2,495, net 1,078, and her dimensions: length, 340 ft.; breadth, 44 ft. 2 in.; depth, 17 ft. Her sister ship *Maid of Orleans* has similar dimensions and speed, but her gross weight is 2,206 tons, net weight 869 tons.

The paddle-wheel steamers of the Northern of France Railway, *Le Pas de Calais*, and *Le Nord* are still in commission and perform certain services between Dover and Calais.

Although the post-war services for civilians were not restored on the Dover-Calais route until January 8, 1920, ordinary travellers were conveyed via Folkestone and Boulogne by certain war service trains within five weeks of the Armistice and on February 3, 1919, a proper service for civilian passengers was inaugurated, Victoria being the London terminus instead of Charing Cross, the popular arrival and departure point of pre-war days.

Another post-war innovation dates from June 15, 1919, and relates to the sea passage. On and from that date the staff officers', &c., train leaving Victoria at 12.55 p.m. was run to Dover, the boat crossing to Boulogne. This was the commencement of regular steamboat trips between Dover and Boulogne and in the reverse direction.

The normal route for Continental boat trains both up and down, between Victoria and Folkestone and Dover is by the Chatham main line to Bickley, and thence over the spur to the South Eastern main line at Orpington, and onward through Tonbridge, but at particular times it may be necessary for the up and down trains to travel by the Chatham line throughout, or by the South Eastern to Ashford and onward by the Chatham line through Maidstone East or *vice versa* as the case may be.

Although the fastest rail and boat Paris service before the war, the 16.30 from Charing Cross did the journey in 6½ hours and the quickest to-day is the 15.45 from Paris (Nord) arriving at Victoria at 22.45 in precisely 7 hours, it must be remembered that more time is required at the ports for the examination of passports, &c., than was necessary in pre-war days.

As to the boat trains running on the South Eastern and Chatham Railway, many RAILWAY MAGAZINE readers will bear in mind the experiences of Mr. Cecil J. Allen, recorded in this periodical for October, 1921. Mr. Allen produced ample vindication of the capabilities of Mr. Maunsell's rebuilt locomotives and gave as his carefully considered opinion that he had found on this side of the Channel better locomotive work being performed than on the Continent, proportionately to the weight and power of the locomotives employed.

Beginning June 1, several day trips for which no passports are required, but no luggage is allowed, became operative and will continue daily during the summer season. Of these the London-Boulogne, third class fare (return) is 29s. 6d. The tripper leaves Victoria at 9.15 a.m. and arrives back at 10.45 p.m., having had over six hours in France. Cheap cross-Channel day trips, Dover to Calais and back, also Folkestone to Boulogne and back, each cost, including the port taxes, a fare of 15s., third class. Then there have been since March 1, what are known as "four ports circular tours." For these passports are essential and luggage is allowed. Tickets, available for eight days, cost 31s. for first class and 24s. 2d. for second class. The tours are (1) Folkestone-Boulogne-Calais-Dover-Folkestone; (2) Dover-Calais-Boulogne-Folkestone-Dover.

As we go to press it is announced that first class season tickets are to be issued between London and Paris, Calais and Boulogne.

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Locomotive and Train Working in the latter part of the 19th Century.

BRECON AND MERTHYR RAILWAY.—[No. I.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

THE Brecon and Merthyr Railway may be divided into two portions, of which the older or northern section extends from Brecon to Pontsticill Junction, whence a branch to Merthyr leaves the main line towards the west, and joins the London and North Western branch from Abergavenny at Morlais Junction. From this point the Merthyr branch is joint, and curls round in a large semi-circle to the west of Merthyr, eventually effecting a junction with the Great Western at Rhydycar, on the south side of the town, from which the trains run into the High Street station of the latter railway. Originally the Brecon and Merthyr Railway used the old Vale of Neath station at Merthyr. As far as the title is concerned, the railway somewhat belies its name. The greater and more important portion of the main line runs south from Pontsticill Junction to Bassaleg Junction with the Great Western, 2¾ miles from Newport, into which town it has running powers over the latter railway. Between Deri Junction and Bargoed South Junction, a distance of about 2½ miles, the main line is interrupted by a section of the Rhymney Railway, over which the Brecon and Merthyr trains have to pass on their way to and from Newport. The distance from Brecon to Pontsticill Junction is 17½ miles, and to Merthyr 24¼ miles. The southern portion from Pontsticill Junction to Newport is 29½ miles long, including 2½ miles of Rhymney, and 2¾ miles of Great Western lines.

Travelling northwards from Newport there is from Aber-Bargoed Junction a direct line up the valley on the Monmouthshire side of the river Rhymney to Rhymney; this branch was formerly the Old Rumney Railway.

The old northern part of the railway is a cross-country line, which runs through some of the most beautiful scenery in Wales. South of Pant Junction (for Dowlais) the line is a mineral railway which descends the valley to Newport, and is one of the many parallel outlets from the South Wales and Monmouthshire coalfields to the coast. The total distance from Brecon to Newport is 47¼ miles of which 28¼ miles from Brecon to Bargoed is single line.

The greater part of the railway may be described as almost Alpine in character, and as far as gradients are concerned it is by far the most difficult line in the country. From Brecon it rises steadily for 4½ miles to Tallyllin Junction with the Cambrian Railways, most of the rise being at 1 in 82 to 1 in 100. Thence it falls to the valley of the Usk at Talybont, 2 of the 2¾ miles being on a grade of 1 in 40. At Talybont begins the worst climb in the Kingdom, a 7¼ mile continuous rise to Torpantau at the rate of 1 to 38 to 1 in 40 for about 6¾ miles, followed by ½ mile of 1 in 68 through the tunnel near the top. The total rise from Talybont is 925 ft. From Pontsticill Junction there is a steep fall followed by a rise to the summit near Dowlais Top. At this point the fall towards Newport begins with about 4 miles of 1 in 38 to 1 in 40, followed by 1 mile of 1 in 45 to 1 in 47. Then follow about 4 miles of 1 in 64 to 1 in 94 down, after which the continuous descent becomes more gradual. Naturally the working of coal and mineral trains down these banks from Dowlais is a very difficult problem. The northern section passing through the open country, and leading to Mid Wales has of course only a comparatively small mineral traffic, and the trains over this section usually consist of mixed goods and coal trucks northwards, conveying strictly limited loads.

As might be expected, special arrangements had to be made, and speeds strictly limited over the heavy portions of the line between Tallyllyn and Bargoed. Passenger trains were not to exceed a maximum speed of 25 miles per hour, and goods trains 14 miles per hour. Goods trains going north towards Brecon from Pontsticill Junction had to stop at the north end of Torpantau tunnel and those going south at

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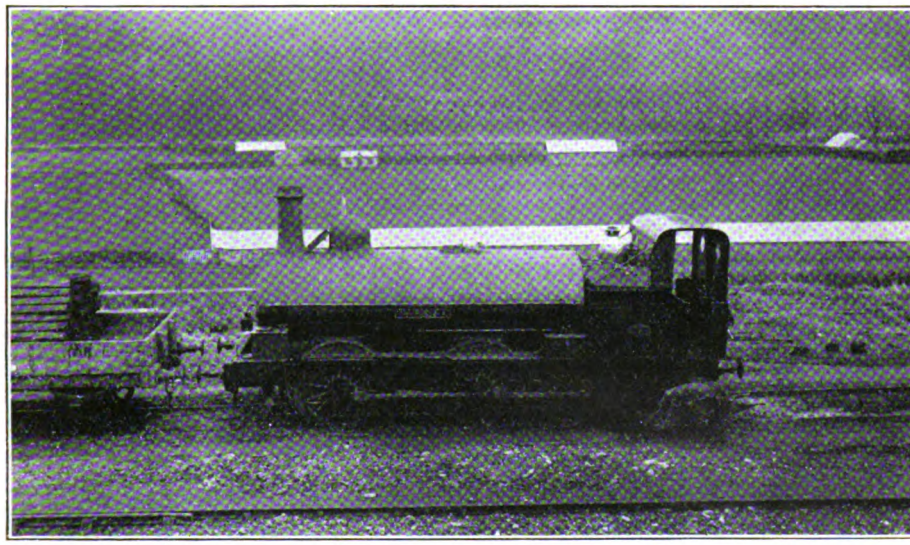
the south end of the same tunnel to pin down wagon brakes. In going up the banks, two engines had generally to be employed, in which case one engine banked the train from the rear. But frequently three engines were necessary, in which case two had to be in front and one at the rear. In descending the banks the two engines had to be in front of the train.

On the southern or mineral section of the railway the heaviest engines, 0-6-0 saddle tanks of the No. 1 class, were limited, to loads of 15 7-ton wagons from Bargoed to Deri and only 12 wagons from Deri to Dowlais Top. These loads were exclusive of the guard's van. As a rail-

usually applied to sets of four or five four-wheeled vehicles, including the van. The connections between the coaches were made by a rectangular jointed rod, which was rotated throughout the train by means of a large wheel in the van. Of course it was non-automatic, but at the time when it was used, automatic brakes were only beginning to be applied experimentally on the Midland and a few other lines. Fay's brake has long since disappeared, and on the Brecon and Merthyr has been replaced by the automatic vacuum brake.

The older engines of the Brecon and Merthyr, the majority of which were designed and built between 1863 and 1872 by



Photo] [*Loco. Publishing Co. Ltd.*

0-6-0 SADDLE TANK ENGINE "RUMNEY."

Built by Sharp, Stewart & Co., in 1866. Wheels 4 ft. 6 in. diam. Cylinders, 17 in. by 24 in.

way it was a distinctly lively proposition, though as a toboggan it may have presented some advantages.

The Merthyr branch from Pontsticill is also heavily graded, and falls practically for the whole distance to Merthyr at the rate of 1 in 46 to 1 in 50.

The necessity for efficient brake power on such a railway is self-evident. At an early stage in the history of continuous brakes the Brecon and Merthyr adopted the Fay and Newall continuous hand brake for passenger trains, which was then also used on many of the Lancashire and Yorkshire trains. This was a mechanical brake operated by the guard only, and was

Sharp Stewart & Company of Manchester, have long since disappeared, though a number of them were still at work at the end of the nineteenth century. The majority of them consisted of 0-6-0 saddle tank engines with inside frames, 4 ft. 6 in. wheels, and 16 in. by 24 in. or 17 in. by 24 in. cylinders. Some of them, such as the "Rumney" (illustrated) were of the "long boiler" type with all the wheels in front of the firebox. For the period when they were built they were fairly powerful, and they worked both passenger and goods trains.

At one period, until the early eighties, all these and other engines bore names only.

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Amongst the names carried by the above-mentioned saddle-tanks were *Pandora, Jupiter, Hercules, Cyclops, Brecon, Beacon, Severn, Rumney, Taff, Atlas, Sir Ivor,* &c. Numbers were given to the engines afterwards; these were painted on the front and back buffer beams, and then some of the old names were gradually removed. The first engines to have number plates were, as far as I recollect, the double-framed 0-6-0 saddle-tank engines built by Messrs. Stephenson in 1884.

There were in addition a few tender engines. Of these the *Caerleon* and *Caerphilly* were built by Sharp, Stewart and Company, in 1865, for the "Old Rhymney" Railway, and were of that firm's standard 0-6-0 type of the same design as those built for the Cambrian and Furness railways with 4 ft. 6 in. wheels and 16 in. by 24 in. cylinders. This class of engine was at one time ubiquitous on many of the smaller English and Welsh lines. One of the two, which became No. 5 on the Brecon and Merthyr, was employed for a considerable period between 1880 and 1890 in working the passenger trains between Newport and Rhymney.

There were also four tender engines, which had originally been the property of the Hereford, Hay and Brecon Railway, a line which now forms part of the Midland Railway. The Brecon and Merthyr arranged to work that line, and continued to do so until about 1868. But it was not a paying concern until the Midland took it over and made it part of a through route from the Midlands to Swansea, and the story goes that in order to reimburse themselves for their out-of-pocket expenses in working the line, the Brecon and Merthyr walked off with its locomotive stock of four engines, and left it stranded.

Of these engines two, the *Alexandra* and *Brecknock*, were Sharp, Stewart's 0-6-0 tender engines, exactly similar to the Old Rhymney engines previously mentioned. The illustration on page 237 of THE RAILWAY MAGAZINE of October, 1921, shows an engine similar to the above.

The other two tender engines, named *Usk* and *Wye*, became Nos. 9 and 10 on the Brecon and Merthyr. They were for many years the only 2-4-0 engines on the line, and were similar to the Furness and Cambrian passenger engines with 5 ft. 6 in. wheels and 16 in. by 20 in. cylinders. They were often to be seen at Newport on the Rhymney service, and I frequently saw No. 9 on those trains. This engine was eventually rebuilt as a 2-4-0 side tank engine, after which it became No. 21. It was scrapped early in the present century and replaced by another 2-4-0 tank engine of more modern design.

There were also three other 0-6-0 tender engines. One of these, the *De Winton*, was an old Manning Wardle engine of 1862 which had been purchased from the Cambrian Railways. The other two were double-framed engines built by Stothert and Slaughter, in 1857, and had, probably, been the property of the Taff Vale Railway. These engines were named *Antelope* and *Elephant*.

All the above tender engines have disappeared long ago, and for many years the Brecon and Merthyr has been worked exclusively by tank engines.

There were also two engines named *Alt* and *Tor*, which are still at work as Nos. 30 and 31. These came from another Welsh Railway, the Neath and Brecon, and were 0-6-0 saddle tank engines with double frames, 4 ft. wheels and 17 in. by 24 in. cylinders.

These engines were designed by Mr. Appleby for the Monmouthshire Railway, and several were built by the Avonside Engine Company of Bristol, and this firm also supplied six exactly similar engines to the Neath and Brecon Railway. When the latter company handed over the working of the part of their line between Ynisygeinon Junction (with the Swansea Vale section of the Midland) and Brecon, to the Midland Railway, the Neath and Brecon found that it had more engines than it required, and sold the two in question to the Brecon and Merthyr. Though built in 1874, they are still "going strong" and proved so useful that a large number of very similar engines were built for the line in later years.

The two 0-6-0 saddle-tank engines Nos. 11 and 17, built by Sharp, Stewart and Company in 1881, merit special mention, because for many years they were the main line passenger engines which worked through between Newport and Brecon. These had inside frames, 4 ft. 6 in. coupled wheels and 17 in. by 24 in. cylinders One of them was stationed at Brecon, and the other in the small Great Western shed at Newport High Street. Each of them

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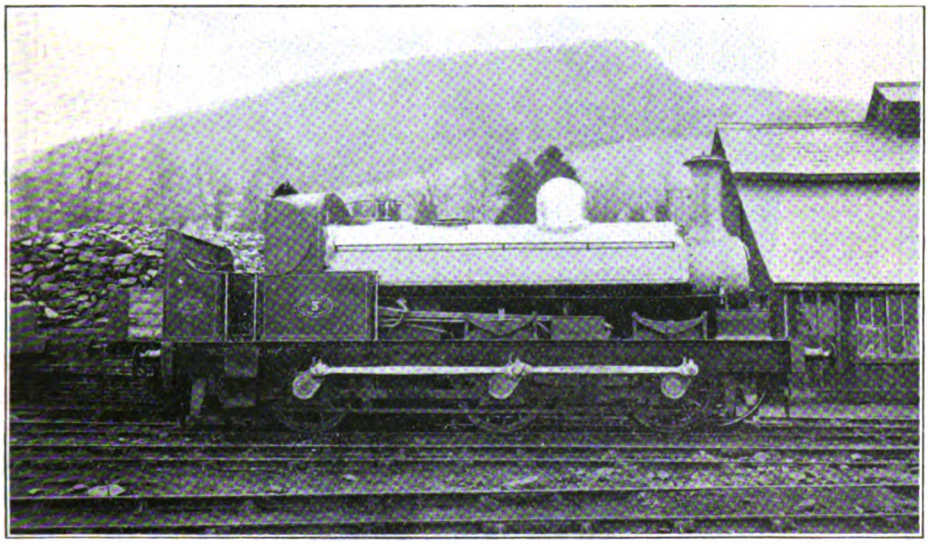
ran through trips both ways daily, and hardly ever seemed to be off duty. No. 11 became No. 18 in 1889. The working of these two engines will be mentioned subsequently.

In 1884–5, twelve 0-6-0 mineral saddle-tank engines were built by R. Stephenson and Company and John Fowler and Company of Leeds, six by each firm, as renewals of some of the older saddle-tanks, which had become unfit for further service. These had double frames, and were very similar to the two engines 30 and 31 previously mentioned. The cylinders were 17 in. by 24 in. and the wheels 4 ft. 2 in. in diameter.

goods engines for the railway in question in which the overall width was even greater than that of the Brecon and Merthyr engines. The engineers' department of the railway company scratched its collective head when this poser was put before it, but as there was nothing further to be said it climbed down as gracefully as possible, and allowed the engines to go through.

Hitherto, most of the passenger traffic of the Brecon and Merthyr had been worked by 0-6-0 tank engines, many of which were used for mineral trains as well. There were of course the two somewhat feeble 2-4-0 tender engines, but these were very much of a "back number," and could hardly be



Photo] **0-6-0 SADDLE TANK ENGINE NO. 3.** [*Loco. Publishing Co. Ltd.*

Built by John Fowler & Co., Leeds, 1885. Wheels 4 ft. 2 in. diam. Cylinders 17 in. by 24 in.

In connection with the delivery of these engines from the north to Wales, an incident occurred which shows the value of keeping old records. When the engines were ready one of the locomotive firms which built them made application to the railway companies, over whose lines they had to pass, to arrange for transit on their own wheels. One of the railways objected to their passage, on the grounds that the overall width over the outside coupling rod crank pins was too great. This seemed an awkward dilemma for the locomotive builders, but on going through their old drawings the latter discovered that fifteen years earlier they had built double-framed

used over the 1 in 38 banks. Nevertheless, it occurred to the locomotive department that perhaps there might be some compensating advantages in the use of passenger engines with four coupled wheels, but before coming to a final decision arrangements were made with the Great Western Railway for the latter to lend the Brecon and Merthyr one of the well-known 2-4-0 side tank engines of Swindon design. This engine worked over the Brecon and Merthyr for some time in 1888, as far as I remember. The company subsequently gave an order to Messrs. R. Stephenson and Company for four similar engines.

(*To be continued.*)

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The Railway Portrait Gallery.

BRIG.-GEN. SIR HUGH W. DRUMMOND, BART., C.M.G.,

Chairman,
London & South Western Railway Company.

HIS MAJESTY THE KING has conferred the dignity of a baronetage on the Chairman of the London and South Western Railway, Brigadier-General Drummond, who has held the position since 1911, having previously been Deputy-Chairman from 1904, and a member of the directorate from 1900. Born at Clovelly in 1859, the third son of Sir James H. W. Drummond, Bart., he has always taken a great interest in military affairs. In 1878 he joined the 1st Devon Militia, and the Rifle Brigade in 1879. Later in life he became a Lieutenant-Colonel in the Yeomanry—viz., the Royal North Devon Hussars. On the outbreak of the Great War he raised a second regiment of Yeomanry, and in January, 1915, was in command of the 2nd South Western Mounted Brigade. He became Hon. Brigadier-General in August, 1917, and in 1918 received the dignity of C.M.G. He is a member of the Royal Bodyguard of Scotland. He has large banking interests, and in addition to being on the board of a great insurance company, is also on the directorate of the Somerset and Dorset Joint Railway, of which the London and South Western Railway Company is part owner.

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British "Pacific" Locomotives Compared.

IN view of the special interest attaching to the Great Western and Great Northern "Pacific" locomotives, and in response to requests, the following particulars of the Great Western "Pacific" locomotive No. 111, *The Great Bear*, and the Great Northern "Pacific" No. 1470, described fully last month, are given in parallel columns, together with those of Sir Vincent Raven's corresponding engine, now under construction for the North Eastern Railway:—

	G.W.R. No. 111.	G.N.R. No. 1470.	N.E.R. Under construction.
Cylinders	15 in. × 26 in. (4)	20 in. × 26 in. (3)	19 in. × 26 in. (3)
Coupled wheels	6 ft. 8½ in. diam.	6 ft. 8½ in. diam.	6 ft. 8 in.
Bogie wheels	3 ft. 2 in. diam.	3 ft. 2 in. diam.	3 ft. 1½ in.
Trailing wheels	3 ft. 8 in. diam.	3 ft. 8 in. diam.	3 ft. 9½ in.
Steam pressure	225 lb. per sq. in.	180 lb. per sq. in.	200 lb. per sq. in
Heating surface—			
Tubes	2,596·97 sq. ft.	2,715 sq. ft.	2,211·2 sq. ft.
Firebox	158·51 sq. ft.	215 sq. ft.	211 sq. ft.
Superheater	505·77 sq. ft.	525 sq. ft.	695·6 sq. ft.
Total	3,261·25 sq. ft.	3,455 sq. ft.	3,117.8 sq. ft.
Grate area	41·79 sq. ft.	41.25 sq. ft.	41 sq. ft.
Coupled wheelbase	14 ft.	14 ft. 6 in.	15 ft.
Total wheelbase, engine	34 ft. 6 in.	35 ft. 9 in.	37 ft. 2 in.
Total wheelbase, engine and tender	61 ft. ½ in.	60 ft. 10⅝ in.	61 ft. 11¾ in.
Weight on bogie wheels	19 tons 18 cwt.	17 tons 1 cwt.	19 tons.*
Weight on leading coupled wheels	18 tons.	24 tons.	20 tons.*
Weight on middle coupled wheels	18 tons.	20 tons.	20 tons.*
Weight on trailing coupled wheels	18 tons.	20 tons.	20 tons.*
Weight on trailing wheels	17 tons 8 cwt.	15 tons 8 cwt.	18 tons.*
Total weight of engine in working order	97 tons.	92 tons 9 cwt.	97 tons.*
Weight of tender loaded	45 tons 19 cwt.	56 tons 6 cwt.	46 tons 2 cwt.
Total weight of engine and tender	142 tons 15 cwt.	148 tons 15 cwt.	143 tons 2 cwt.*

* Estimated weights.

By the courtesy of Sir Vincent Raven, K.B.E., Chief Mechanical Engineer, North Eastern Railway, we are also enabled to reproduce an outline dimensioned drawing of the 4-6-2 locomotive now being built at Darlington to his designs. Additional interest attaches to these new engines, of which two are to be constructed, inasmuch as they are intended for fast passenger traffic on the East Coast route, and on completion will work in conjunction with the new engines of the same type on the Great Northern Railway. Furthermore, both are of the 3-cylinder single-expansion type, but, whereas in the case of the Great Northern engine the cylinders drive the middle pair of coupled wheels, in the new North Eastern Railway locomotive they drive the leading pair, the cranks being set 120 deg. apart. Sir Vincent Raven's new engine is remarkable for its proportional characteristics. The boiler has an outside diameter of 6 ft. (or 6 ft. 3½ in. outside clothing), the length between tube plates being 21 ft. It carries a working pressure of 200 lb. per sq. in., and has a total heating surface of 3,117·8 sq. ft. Three safety-valves are mounted one behind the other above the firebox.

The diagram shows the general appearance of the engine and tender, giving the estimated weights and leading dimensions, etc. The cylinders, as already stated, are three in number, each 19 in. in diameter by 26 in. stroke. The cylinders and steam chests are in one casting, the steam chests being common to all, while the three exhaust chambers are separate to the

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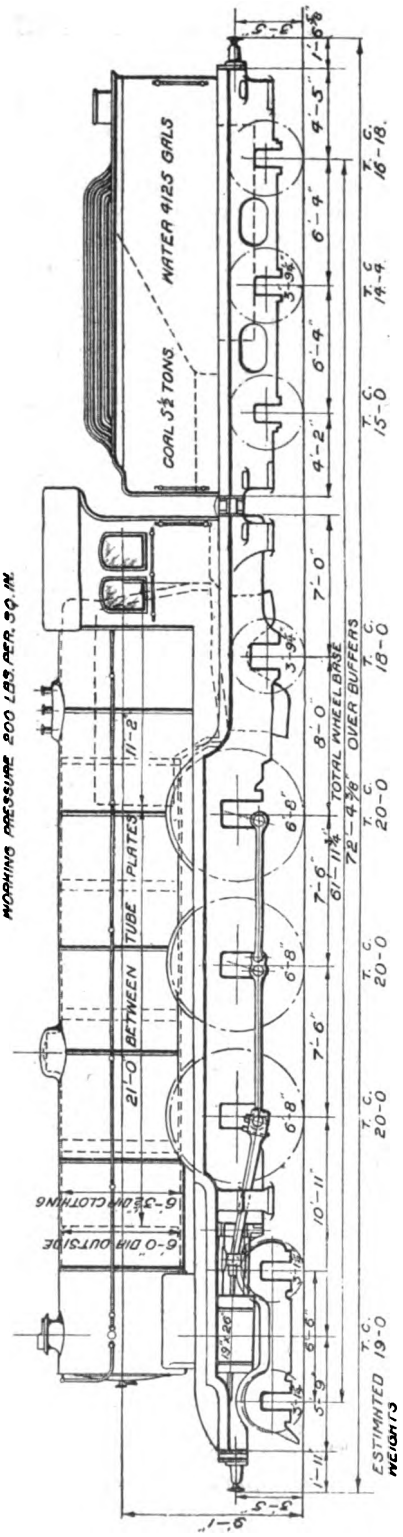
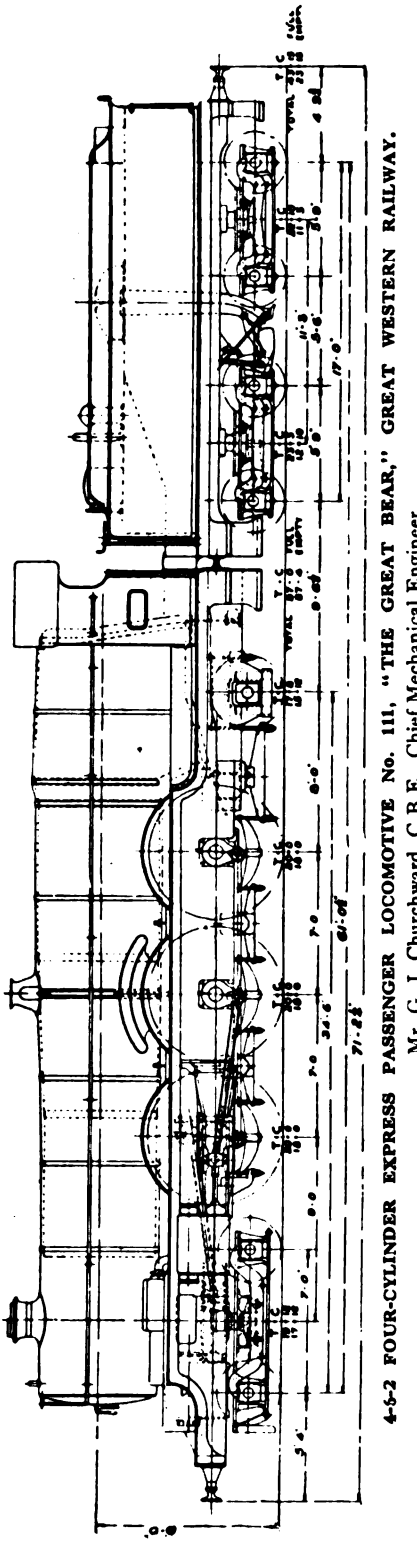


4-6-2 THREE-CYLINDER EXPRESS PASSENGER LOCOMOTIVE, NORTH EASTERN RAILWAY.

Sir Vincent Raven, K.B.E., Chief Mechanical Engineer.



4-6-2 FOUR-CYLINDER EXPRESS PASSENGER LOCOMOTIVE No. 111, "THE GREAT BEAR," GREAT WESTERN RAILWAY.

Mr. G. J. Churchward, C.B.E., Chief Mechanical Engineer.

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bottom of the blast pipe, where they combine. The cylinders are fitted with piston valves 8¾ in. in diameter, and the valve gear—Stephenson's link motion—is applied direct to each of the cylinders. The driving wheels are 6 ft. 8 in. in diameter, and the rigid wheelbase 15 ft., the total wheelbase for the engine being 37 ft. 2 in.

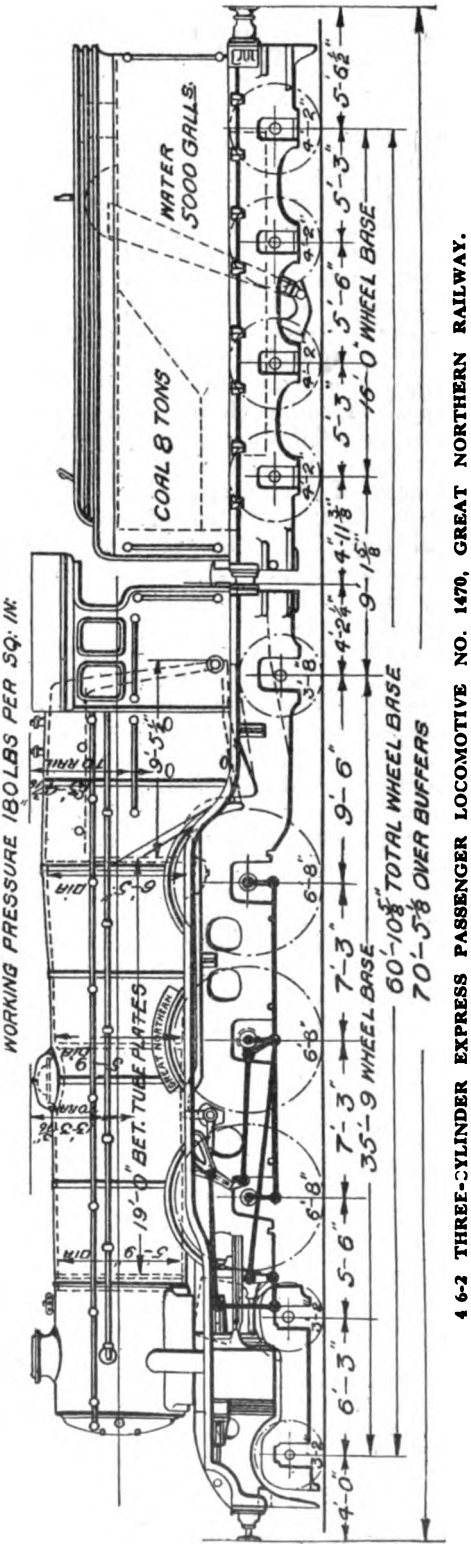
The bogie wheels are 3 ft. 1¼ in. in diameter, and arranged on a wheelbase of 6 ft. 6 in.; carrying wheels 3 ft. 9¼ in. in diameter are employed, these being fitted with radial axle-boxes with a side movement of 3½ in. The boiler is fitted with a round-topped firebox casing. The tubes are 2¼ in. in diameter, and the smoke tubes 5¼ in. in diameter. There are 118 of the former, and 24 of the latter, with superheating elements. The firebox casing is 8 ft. long by 6 ft. 5 in. at the bottom, the actual grate area being 41 sq. ft., the firebox is extended into the barrel of the boiler, and its outline is shown in the diagram, its overall length being 11 ft. 2 in. The effect of this extension has been to reduce the length of tubes and increases the firebox heating surface, whilst it further acts as an additional combustion chamber.

The distribution of heating surface is as follows :—

	Sq. ft.
Ordinary tubes	1,517·6
Superheater tubes	693·6
Superheater elements ..	695·6
Firebox	211
Total	3,117·8
Grate area	41

The tenders are of the self-trimming type, carrying 5½ tons of coal and 4,125 gallons of water. They are six-wheeled, having a wheelbase of 12 ft. 8 in. The combined wheelbase of the engine and tender is 61 ft. 11¾ in., and the length over buffers overall 72 ft. 4⅜ in. The weights are given in the diagram, from which it will be seen that the weight available for adhesion is 60 tons, while the total of engine and tender in working order is 143 tons 2 cwt.

The engine develops a tractive effort at 85 per cent. of boiler pressure, of 29,918 lb. It will be noted that according to the estimated weights, each pair of coupled wheels supports 20 tons, thus affording 60 tons of adhesion, and giving an adhesive factor of 4·49.



4-6-2 THREE-CYLINDER EXPRESS PASSENGER LOCOMOTIVE NO. 1470, GREAT NORTHERN RAILWAY.
Mr. H. N. Gresley, C.B.E., Chief Mechanical Engineer.

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Institute of Transport London Congress.

THERE can be no doubt as to the unqualified success of the Transport Congress, held in London, May 17-20, as announced last month, and arranged by the Institute of Transport. Indeed, the Council of the Institute, and particularly Mr. H. E. Blain, Hon. Secretary, with his staff, are to be congratulated upon the completeness of the arrangements made, and particularly for the close attention to detail so essential where a membership of over 1,200 is concerned, involving acceptances of invitations to functions and visits to the number of 1,000 or more, all requiring to be correlated and those concerned duly advised. In this respect, in fact, the conduct of the Congress was a credit to everyone concerned, while the generous hospitality accorded by railway companies, other transport agencies and private firms contributed very greatly to the success of the Congress as a whole. The social functions were well attended; the papers contributed were of a high order and written by acknowledged authorities; and the visits covered a wide range, the numbers attending indicating that the invitations were valued and the opportunities of making them highly appreciated. Space will not permit of more than brief summary, but the principal points of interest are brought out in the following review of the proceedings.

Social Functions.

The Congress was inaugurated on Tuesday, May 16, by a reception at the Hotel Metropole, from 7 p.m. to 10 p.m., when the President of the Institute, Sir Henry P. Maybury, K.C.M.G., C.B., received the delegates and visitors and their ladies. The formal opening took place the next morning, Sir Henry P. Maybury, President, presiding, at the Institution of Civil Engineers, Great George Street, Westminster, S.W. 1. The President was supported by Sir Sam Fay, Sir Philip Nash, Mr. Roger T. Smith, Mr. H. H. Gordon, Sir J. G. Broodbank, Mr. H. E. Blain (Hon. Secretary) and other Members of Council. The Right Hon. Stanley Baldwin, M.P., President of the Board of Trade, on behalf of His Majesty's Government, briefly addressed the delegates and formally opened the Congress. Sir Henry Maybury proposed a hearty vote of thanks to the Right Hon. Stanley Baldwin, M.P., for his address, and called upon Sir Sam Fay, General Manager, Great Central Railway, to second the proposal. Sir Henry Maybury then briefly addressed the meeting in an official welcome to the delegates from foreign countries.

On Wednesday evening the Right Hon. the Lord Mayor and the Lady Mayoress (Sir John J. and Lady Baddeley) entertained the delegates to the Congress and their ladies at a Conversazione at the Mansion House. There was a very large gathering, and the scene in the large salon was a brilliant one.

On Thursday the great event was the third annual dinner of the Institute, held at the Savoy Hotel. Sir Henry P. Maybury, President, occupied the chair, and was supported by a large gathering, which included many distinguished transport authorities. In all there were nearly 400 present, and the scene in the magnificent dining room was a brilliant one. The Rt. Hon. Edward Shortt, K.C., M.P., Secretary of State for Home Affairs, proposed the health of "The Institute of Transport and the Transport Industry," coupling with it the name of Sir Henry P. Maybury, K.C.M.G., C.B., who replied in a brief but interesting speech. Mr. Arthur Watson, C.B.E., General Manager, London and North Western Railway, proposed the health of "Our Guests." Mr. Arthur Neal, M.P., Parliamentary Secretary of the Ministry of Transport, first responded to this toast in a humorous speech containing many topical allusions. Mons. D. A. Van Heyst, Chief Engineer of the Waterstaat and member of the Dutch Road Commission, provided a short further response.

Meetings and Papers.

On Wednesday, Thursday and Friday morning sessions were held at the Institution of Civil Engineers, a number of

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important papers being read, several of great railway interest, not only from their subject matter but also because of the high standing of the writers, and the many important points brought out in discussion. At 10 a.m. on Wednesday, under the chairmanship of the President, a paper was read by Sir Cyril Kirkpatrick (Member) on "Recent Improvements in Transport Facilities in the Port of London." This was followed by a paper by Captain M. H. P. Riall Sankey, C.B., C.B.E. (Past-President, Institution of Mechanical Engineers), on "Wireless as an Aid to Transport." This paper was concerned chiefly with the application of wireless to marine and aircraft work, the development in road and rail communication having been comparatively small.

Wireless for Moving Trains.

Mr. Roger T. Smith, Electrical Engineer, Great Western Railway, who opened the discussion, detailed some interesting experiments carried out in 1919 with a view to the possibilities of wireless communication with moving trains. With a power of 120 watts telegraphic signals transmitted from the signal corps station at North Woolwich were received successfully in a coach attached to a morning train from Paddington to Bristol. Throughout the journey of some 117 miles no serious diminution of signal strength was noticed except when passing through deep cuttings. On another occasion signals were sent from a 120-watt set on the 5 p.m. train to Fishguard. North Woolwich received these transmissions up to 70 miles distance, but was interfered with by a Royal Air Force station working on approximately the same wave-length. Mr. Smith emphasised that the experiments were not made with a view to the replacement of the ordinary block telegraph, &c., signalling arrangements, but purely from a military point of view. Mr. F. A. Cortez Leigh, Divisional Electrical Engineer (Division "A"), London and North Western Railway, mentioned experiments in wireless telephony carried out between Euston and Crewe, distance of 158 miles. Speech at times was perfect, but interference was caused by other wireless stations and local noises. Such an installation would have been useful when their land line telegraph was paralysed after the great storm in 1916.

In the reading room of the Institution of Civil Engineers, simultaneously with the first paper above mentioned, Mr. A. Dryland (Member of Council) in the chair, a paper by Colonel C. H. Bressey, O.B.E. (Member) on "The Design, Construction and Maintenance of Highways in Relation to the Development of Mechanically Propelled Vehicular Traffic," was read and discussed.

On Thursday, in the Lecture Theatre of the Institution of Civil Engineers, the President of the Institute in the chair, Mr. Neville Chamberlain, M.P., read a paper on "Inland Water Transport—A Practical Policy." Simultaneously, in the reading room of the Institution, Mr. E. S. Shrapnell-Smith, C.B.E. (Vice-President) in the chair, a paper was read by Sir John E. Thornycroft, K.B.E., on "The Future Design of Road Vehicles for Passenger and Goods Services."

Foreign Railway Practice.

A paper under this title was submitted by Prof. J. Carlier, Assistant Professor of Railways, Liège University, and read at the morning session on May 19, Sir Sam Fay, General Manager, Great Central Railway (President-Elect of the Institute) in the chair. The paper proved to be a dissertation on new features in railway traction methods, thus partaking of an engineering rather than of a "traffic" or operating character. It contained, however, a great deal of interesting material, particularly as it dealt with questions of cost respecting different systems of traction and comparisons made between one country and another, including references to electrification schemes in the United Kingdom. The author described in some detail various locomotives working on the internal-combustion, turbo-electric, &c. systems, including the "Heilmann," the "Ramsay," the "Zoelly" turbine and others, comparing them both with the steam locomotive and electric traction pure and simple, and laying special stress on the advantages of condensing steam wherever possible.

"Safety" in Railway Operation.

A "full house" assembled to hear Colonel Pringle's paper which followed, additional chairs having to be brought into the reading room of the Institution of Civil Engineers, and many hearers

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having to stand. The chair was occupied by Sir Sam Fay, General Manager, Great Central Railway, instead of by Sir Thomas Williams as originally announced. The paper was described as an attempt to sketch in outline the fundamental principles governing the safe conduct of traffic in respect of methods of operation, equipment, &c.; to show how accidents originate; and to suggest directions in which these principles require to be either extended or reinforced, so that a higher degree of security in operation may be obtained.

For more than 30 years the three basic requirements for safe operation has been universally recognised to be :—

(*a*) Adequate signalling.
(*b*) Block working upon double lines, and token working on single lines.
(*c*) The use of a continuous automatic brake.

Statistics show that no great immunity from accident connected with the movement of trains has been obtained as to warrant the conclusion that danger in the conduct of traffic is negligible. During the past three years the average number of collisions reported, in which passenger or goods trains, or both, were concerned, was 250; of collisions with buffer stops, 42; and of collisions with level crossing gates, 255. In the same period derailments of trains and engines have averaged 480 in 12 months; whilst the number of cases of trains dividing reached the figure of 8,876 in the year 1921. The casualty list of killed and injured in accidents is largely fortuitous, and hardly a reliable criterion of potential danger.

An analysis of some 200 of the more serious accidents which have been fully reported upon during the past 10 years followed. This showed that about 20 per cent. of accidents originated in failure of mechanical equipment, &c., whilst 80 per cent. were directly due to failure of the human agent.

The Good Record of Single Lines.

During the 10 years under survey only 12 accidents on single lines called for full inquiry and report, this number being about 6 per cent. of all the cases investigated. Colonel Pringle therefore suggested that single lines are operated under token systems with a higher degree of security than railways with two or more tracks. In fact, during the period considered, in only three of these accidents did token working come under suspicion. In this connection, Colonel Pringle suggested that the directions in which an increase in the factor of safety will be found are :—

(1) Strict and alive supervision to check irregularities and confusion arising from divided responsibility in connection wth the working of point and signal levers, token instruments, and the control and transfer of tokens.

(2) Location of token instruments in signal boxes, whenever possible.

(3) Interlocking of the token with the relative starting signal lever, whenever the instrument is necessarily located elsewhere than in a signal-box; also at passing places where apparatus for exchanging tokens at speed is used, and at single line junctions where special difficulties exist in connection with the transfer of tokens.

(4) The use of covered conductors for token instrument circuits.

Accidents on Double and Multi-Track Lines.

Dealing with the largest class of accidents due to human failure, *i.e.*, those occurring on railways with more than one line of way, the number of cases critically examined has been 148. These cover a wide range and, for convenience, have been divided into three subheads :—

(*a*) Failures of signalmen, 49—about 25 per cent. of the whole.

(*b*) Failures of enginemen, 65—about 33 per cent. of the whole.

(*c*) Miscellaneous, 34—about 16 per cent. of the whole. Total, 148.

Accidents under these headings were analysed in detail, a great many important points being brought out. In the case of failures of signalmen, Colonel Pringle suggested that the sovereign remedy is track circuiting, which provides an all-time automatic detection of vehicles in occupation of lines. He also argued that outer home signals should be provided, wherever possible, to obviate the use of the warning acceptance. In regard to failures of enginemen it was pointed out that there are fewer safeguards against mistakes to which enginemen are liable than against

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other causes from which accidents originate. In this connection, reference was made to the use of automatic train control devices, the necessity for avoiding possible misunderstanding or confusion from the use of calling-on signals for a diversity of purposes, and the use of colour light signals under certain circumstances. The third section covered 34 cases, for all of which obvious remedies could be suggested, according to each particular set of circumstances.

General Conclusion.

The general conclusion is that preventive or beneficial effect would have resulted by means of :—

Automatic train control in 33 per cent. of the cases.

Track circuiting in 20 per cent. of the cases.

Continuous brakes upon goods trains in 10 per cent. of the cases.

Better methods of working or equipment, &c., in 10 per cent. of the cases.

By greater care and precaution on the part of personnel in 17 per cent. of the cases, 90 per cent., leaving a number of cases which may reasonably be described as unpreventable, 10 per cent., 100 per cent.

It has been mentioned that, in the year 1921 there were 8,876 cases of trains dividing. Of these, 6,354 were concerned with goods trains and 2,522 with passenger trains. The accidents resulting from these cases of division were 50 and 5 respectively. The liability to accident from division appears therefore to be four times as great in the case of unfitted trains. It is estimated that, in the 50 cases of accident due to goods trains dividing, more than half would have been prevented by use of a continuous brake. A number of level crossing accidents also yearly result from difficulties experienced in controlling, or by misjudgment of braking effect upon, unfitted trains. These would also be prevented by use of a continuous brake.

The paper was followed by a lively discussion in which many further points of great interest were brought out. The speakers included Mr. C. J. Selway, C.B.E., Superintendent of the Line, Great Northern Railway; Mr. J. P. Thomas, Operating Manager, "Underground" Railways; Mr. W. J. Thornowgood, Signal and Telegraph Superintendent, London and South Western Railway; Major Budden, North Western State Railways of India; Mr. A. F. Bound, Signal Engineer, Great Central Railway, and Mr. F. V. Russell, C.B.E., Superintendent of Operation, Great Eastern Railway.

Formal Closing of the Congress.

The meeting then adjourned to the lecture theatre of the Institutiton of Civil Engineers to combine with the meeting there for the formal closing of the Congress. Sir Henry Maybury, President, expressed his pleasure at the conspicuous success which had attended the Congress from first to last, but laid special stress upon the fact that this was so largely due to the care and attention to every detail given by Mr. H. E. Blain as hon. secretary and his staff, mentioning particularly Mr. H. Winter Gray. Mr. Blain replied, describing this as "the first unrehearsed incident" of the Congress. He was glad of the opportunity of referring to the fact that he had received nothing but kindness and co-operation from everyone concerned, railway companies, other transport agencies and private firms, and in every quarter, while the eminence of the people who had contributed to the proceedings was one of the most encouraging features. He thanked Mr. Winter Gray and the "people at the office who had worked long and late." With regard to the Institute, he said that they had started with great ideas, and it had been a source of much gratification that so much progress had been made. But this had only been attained by the co-operation of all concerned. The Institute was also greatly indebted to the press, not only in connection with the Congress, but also since the formation of the Institute, though "they hoped to ask still more of them."

Mr. Russell's Lecture.

There was a splendid attendance at the Royal Society of Arts on Friday, May 19, to hear Mr. F. V. Russell, C.B.E., Superintendent of Operation, Great Eastern Railway, give his lecture on "The Operation of Heavy Suburban Passenger Services on a Steam Railway, with Particular Reference to Density of Service, Terminal and other Facilities." Mr. Russell had provided the most lengthy contribution included in the Congress proceedings, but,

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while adopting the principle of explaining everything as he went along, having regard to the fact that the lecture was primarily prepared for a students' and graduates' meeting of the Institute, the paper included lengthy portions lined in the margin of the printed copies, and these were not read. The lecture as a whole, however, was full of "good things," and the unread portions are really of great value, and fully warrant the suggestion that they should be read and studied at leisure.

In introduction Mr. Russell explained that, although his lecture dealt with steam-operated suburban services he was not in any sense an advocate of steam as against electric operation. But with steam operation, especially in congested areas, there are many handicaps not experienced with electric operation. At the same time, there are certain things of advantage in common use on electrically-operated railways and not in common use on steam-operated railways, that can be applied either directly or by equivalent means to steam operation. The chief things unattainable in a practicable manner with existing steam locomotives but attainable with electricity are :—

(1) Extremely high acceleration with heavy loads.

(2) High speed on up gradients with heavy loads

(3) Power to negotiate abnormal gradients with heavy loads.

(4) Small train headway tunnel working, free from ventilating difficulties.

(5) Loading driving axles to the maximum deadweight permanent-way allowance for adhesion purposes.

(6) Even torque on driving axle.

(7) Coupling two or more locomotives together and working them by one man.

(8) Locomotives and motor fitted stock available for use at a moment's notice.

Mr. Russell then dealt with certain handicaps to which steam traction is subjected, discussing the traffic possibilities opened up by electric traction and suggesting that certain points of advantage in common use on electrically-operated railways and not in common use on steam-operated railways can be applied either directly or by equivalent means to steam operation :—(1) Rapid terminal operation ; (2) power signalling ; (3) signal location arranged to give maximum facilities ; (4) automatic train stops ; (5) automatic signals ; (6) provision of frequent trains with high acceleration in non-crush periods. These were analysed at length, and stress was laid upon the necessity for introducing systematic and "symmetrical" schedules instead of merely altering and adding trains to increase facilities on a "confused" method. A number of important points were brought out by Mr. Russell, but space will not permit of their being considered in detail here. Indeed, there was a great abundance of useful material, and no one privileged to be present but will agree that the whole-hearted applause of the audience, and the appreciative remarks at its conclusion by the chairman, Mr. Arthur Watson, C.B.E., General Manager, London and North Western Railway, were entirely and fully justified. As a lecture there was no discussion, but Mr. Watson referred to several points. The paper was obviously based very largely upon Mr. Russell's experience on the Great Eastern Railway, though it was of general application and only once was Great Eastern practice directly indicated, but this experience had been gained in dealing with "the most difficult traffic in London, if not anywhere." He (Mr. Watson) had had some experience with terminal working at large stations, and with both steam and electric trains, but he agreed with Mr. Russell that whatever arrangements are made as to platforms for particular trains, &c., when dealing with crowds, these must be adhered to unless in the most exceptional circumstances. He emphasised the value of electrification in reducing train and engine movements at terminals, and referred to the use of "Telewriter" apparatus in the United States for special announcements, emanating from a signal cabin or office perhaps several miles away, but exhibited at several places about a large station. In regard to the use of subways, &c., for luggage, he mentioned the overhead traveller used at Victoria station, Manchester. Mr. Watson also added a few remarks on "interlocking block," controlling alternative routes at diverging points, short section working with track circuit, automatic train stops and the human element ("we must not lightly

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accept anyone's dictum," and it is necessary to consider for oneself the conditions of inter-urban electric traffic and steam-operated lines which it is proposed to electrify), the use of hooters or syrens at signal-boxes, as suggested by Mr. Russell to call attention to emergency conditions, the difficulties occasioned by shifting and local fogs, and the importance of the time element in so many of the measures suggested and whose value may outweigh the cost of special apparatus. In a few concluding remarks Mr. Russell said that much depends upon the lay-out of a railway as to what is advocated. He also mentioned that he had had actual experience of the value of a hooter as suggested while in America. He had found the "Telewriters" referred to by Mr. Watson in use all over the place. He gave three minutes as the best headway generally practicable on steam lines in Great Britain, and in America three and a half minutes.

Visits to Places of Railway and Transport Interest.

The afternoons of Wednesday, Thursday and Friday, and part of Saturday, were given over to a number of visits to places of interest, there being in most cases several alternative visits. On Wednesday afternoon one party travelled by special train to Rickmansworth, where they were entertained to luncheon by the Metropolitan Railway Company, represented by Mr. R. H. Selbie, C.B.E., General Manager; Mr. W. Holt, Traffic Manager; Mr. J. Wardle, Commercial Manager, and other officers. The special train then proceeded to Chorley Wood, the party halting to view the Cedars Estate, returning to Wembley Park to visit the site of the proposed British Empire Exhibition, and continuing thence to Neasden to inspect the Metropolitan Railway power station there, special attention being given to new plant recently added and to the new switch house now in process of construction.

Members attending Visit D assembled in the office of Mr. E. Falconer, London Goods Operating Superintendent, Midland Railway, at Somers Town goods depôt. Along with Mr. Falconer were Mr. J. Pepper, Assistant Goods Manager; Mr. E. H. Hackwood, London Goods Commercial Manager, and Mr. W. H. Watson, Goods Superintendent at Somers Town.

Other visits were to Dockland, a special train being provided by the Great Eastern Railway to Custom House station; to Marconi House, Strand; and to Hounslow, to inspect the New Great West arterial road, and bridges over the Metropolitan District and London and South Western Railways.

Waterloo Station and Feltham Marshalling Yard.

On Thursday about 60 delegates and visitors assembled at the new "Victory" Archway, Waterloo station, for the purpose of inspecting the new station and paying a visit to the Feltham marshalling yard of the London and South Western Railway. They were received by Mr. A. W. Szlumper, C.B.E., Chief Engineer; Mr. G. F. P. West, C.B.E., Superintendent of the Line; Mr. R. D. Hawes, New Works Assistant; Mr. F. Bushrod, O.B.E., Assistant Superintendent of the Line; Mr. F. V. Milton, Publicity Superintendent, and others, and were shown the principal points of interest in the new station. A special train was provided by the courtesy of the London and South Western Railway and, on arrival at Feltham yard, the visitors were escorted to the down hump where they watched the process of gravitational shunting. They also inspected the signal cabin, where Mr. W. J. Thorrowgood, Signal and Telegraph Superintendent, explained the working of the electric switch control board. The delegates subsequently returned to London via Weybridge, and were entertained to tea *en route*.

Another party, number about 150, visited the Chiswick Overhaul Works of the London General Omnibus Company, afterwards proceeding to the power station of the "Underground" Railways at Lots Road, Chelsea. On arrival at the Chiswick Works luncheon was served, the chair being taken by Mr. H. E. Blain, C.B.E., Assistant Managing Director, of the "Underground" Companies, supported by Mr. Sidney Preston, C.B.E., Member of Council, Institute of Transport, and Colonel J. Nall, D.S.O., M.P. (Hulme Division of Manchester). A tour of the works was subsequently made under the guidance of the Chief Engineer and Operating Manager of the London General Omnibus Company, Mr. G. J. Shave, the engineer

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in charge, Mr. C. Leese and members of his staff. The members of the party were then conveyed in motor 'buses to Lots Road Power Station, where every facility was afforded them of making acquaintance with the details of the equipment and system of operation. Another visit, also on Thursday afternoon, was to the aviation works at Weybridge of Messrs. Vickers, Limited, the party travelling by special train from Waterloo.

Reading Signal Works, Great Western Railway.

A visit to the signal works of the Great Western Railway at Reading was arranged for Friday afternoon. About 60 delegates were conveyed by special omnibuses from the Institution of Civil Engineers to the Great Western Hotel, Paddington, where they were entertained to luncheon by the courtesy of the Great Western Railway Company. Mr. Roger T. Smith, Electrical Engineer, presided at the luncheon, and was supported by Mr. A. T. Blackall, Signal and Telegraph Engineer; Mr. J. Milne, Principal Assistant to the General Manager; Mr. H. L. Wilkinson, Assistant Superintendent of the Line; Mr. R. J. S. Insell, Chief Assistant to the Signal and Telegraph Engineer, and others. Before leaving for Reading at 2 p.m. a vote of thanks to the Great Western Company was carried, a brief response being made by Mr. Roger T. Smith. On arrival at Reading, the visitors were divided into groups and escorted by Mr. Blackall and his assistants round the various sections of the signal works, which were established about 1855. A special dining car was attached to the 5.8 p.m. train from Reading, and on the journey the visitors were entertained to tea. Other parties visited the Greenwich generating station and the Charlton car repair sheds of the London County Council, or the Aircraft Disposals Company's premises, and the London Terminal Aerodrome at Waddon, a special train being provided by the London, Brighton and South Coast Railway Company.

Visit to Liverpool Street Station.

On Saturday morning some 70 or 80 delegates and visitors arrived at Liverpool Street station, the first party of 20 being started off well before 7.45 a.m., the advertised time of assembly. The parties were conducted by Mr. H. J. Prytherch, M.B.E., Chief Assistant; Mr. J. E. Sharpe, M.B.E., Chief Clerk, and Mr. H. F. Hilton, Outdoor Assistant to the Superintendent of Operation; Chief Signal Inspector Worstead, and Mr. H. J. Wardley, Assistant to the Chief Civil Engineer; together with Mr. J. Miller, Chief Civil Engineer; Mr. W. H. Bird, Signal Engineer; Mr. J. Thomson, Architect, and other Great Eastern Railway officers. The visitors observed first the arrival of workmen's trains at platforms 1-4, where the special "intensive" service is operated. They then inspected the engine docks and watched train and engine working, afterwards crossing to the east side as the season-ticket traffic rendered platforms 12 to 18 busy. The following particulars of Liverpool Street station and its traffic will be of interest:—Opened for local traffic, February 2, 1874; for all traffic, November 1, 1875; east side added, April 2, 1894; all-night service to Walthamstow inaugurated, June 21, 1897. Area of station, 16 acres; number of roads, 20; number of platforms, 18; length of longest platform, 906 ft.; total length of platform faces, 11,126 ft. Signal cabins:—East, 136 levers; West, 244 levers. Number of trains dealt with in one day, 1,264. Numbers of passengers:—In one day (November, 1921), 229,073; arriving between 7.30 a.m. and 9.30 a.m., 66,468 (over nine per second); leaving between 5 p.m. and 7 p.m.:—East side, 24,851; West side, 43,116; total, 68,017 (over nine per second). Number of season tickets available at Liverpool Street, 60,900. Record number of passengers purchasing tickets at Liverpool Street (July 31, 1920), 520,729, realising £19,495.

At 8.30 a.m. breakfast was served by the company in the Grill Room on the footbridge. Before the visitors separated, Mr. H. J. Prytherch expressed, on behalf of the Great Eastern Railway Company, the general manager, the superintendent of operation, and the chief civil engineer, appreciation of the fact that so many had come along to see something of their early morning traffic working. Mr. H. E. Blain, C.B.E., hon. secretary of the Institute of Transport, expressed the thanks of all present for the way they had been received and the steps taken to explain everything by Mr. Prytherch and his

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colleagues. Mr. J. Miller, Chief Civil Engineer, added a few words, endorsing Mr. Prytherch's remarks in welcome, and thanking Mr. Blain for his expressions of appreciation.

Euston and Stonebridge Park Power Station.

Over 100 delegates and visitors assembled in the main hall at Euston Station for the purpose of inspecting various points of interest there, and of paying a visit to the large power station at Stonebridge Park. The delegates were received by Mr. Arthur Watson, C.B.E., General Manager; Lieut.-Col. F. A. Cortez Leigh, Divisional Electrical Engineer; Mr. G. N. Ford, District Passenger Superintendent and other London and North Western officers. The visitors were escorted by Mr. Arthur Watson round the large hall and through the board room, thence proceeding to the Doric Gateway and the departure platforms, where Mr. Arthur Watson described the principal features. A special train was provided by the courtesy of the London and North Western Railway Company, and at 10 o'clock the visitors left for Stonebridge Park. On arrival there, they were divided into several groups and escorted round the station. The boiler plant comprises five units of four boilers, each capable of evaporating 25,000 lb. of steam per hour at a pressure of 210 lb. per sq. in., and superheated to a total temperature of about 590° Fahr. Each pair of boilers has its own economiser, which is of the usual "Green" pattern. The boilers were supplied by Babcock & Wilcox, and are fitted with the latest form of "drop link" travelling grates. The fuel supplied to each pair of grates is weighed by an automatic "Avery" weigher. Natural draught is obtained by the use of two large brick chimney stacks, 240 ft. high by 14 ft. internal diameter.

The power station is laid out at present for five main units of 5,000 kw. and an auxiliary unit. Four of the main turbines and alternators, and the five condensing equipments are at present installed. The turbines are of the Metropolitan Vickers "Rateau" type, coupled to English Electric Company's alternators. They have a normal rating of 5,000 kw. at a power factor 0·9, 11,000 volts three-phases 25 cycles per second, and run at 1,500 r.p.m. The overload rating is 6,250 kw. for two hours. Each unit has its own directly-connected exciter. There are 10 sub-stations outside the power house and one located in the power house, each arranged for converting from 11,000 volts three-phase A.C. to 630 volts D.C., at which pressure current is supplied to the conductor rails. After inspecting the power station on a very comprehensive basis, the party was escorted through the train repair and inspection shops.

At the conclusion of the inspection, the party was entertained to lunch by the courtesy of the London & North Western Railway Company, Mr. Arthur Watson, C.B.E., presiding. At the end of the luncheon, Sir Henry P. Maybury, President of the Institute of Transport, proposed a warm vote of thanks to the chairman for the facilities afforded by him in connection with the inspection of the power station, and also for the hospitality of the railway company. Sir Henry continued by saying that so long as the Institute of Transport could command the keen interest of men like Mr. Arthur Watson, he was sure it would have a brilliant future. He was betraying no secrets when he told the delegates that Mr. Watson had allowed himself to be nominated as a Vice-President of the Institute. The vote was carried with musical honours, and, in a brief speech, Mr. Watson said it was the desire of the Board of his company, as it was his own desire, that they should make the visit of the delegates to the power station one of interest, enjoyment and pleasant memory.

Visit to Marylebone Station.

About 40 visitors assembled at Marylebone station, where Great Central Railway 2-8-0 engines Nos. 420 and 966 were drawn up on No. 4 platform for inspection, large sectional drawings being available for examination. The party was received by Sir Sam Fay, General Manager, and Mr. J. G. Robinson, C.B.E., Chief Mechanical Engineer, together with Mr. R. Thom, Assistant to Chief Mechanical Engineer, Mr. W. G. P. Maclure, Locomotive Running Superintendent, and Mr. W. Rowland, Chief Draughtsman, locomotive department. Specimens of the fuels used by the two engines were provided for examination. Engine No. 420

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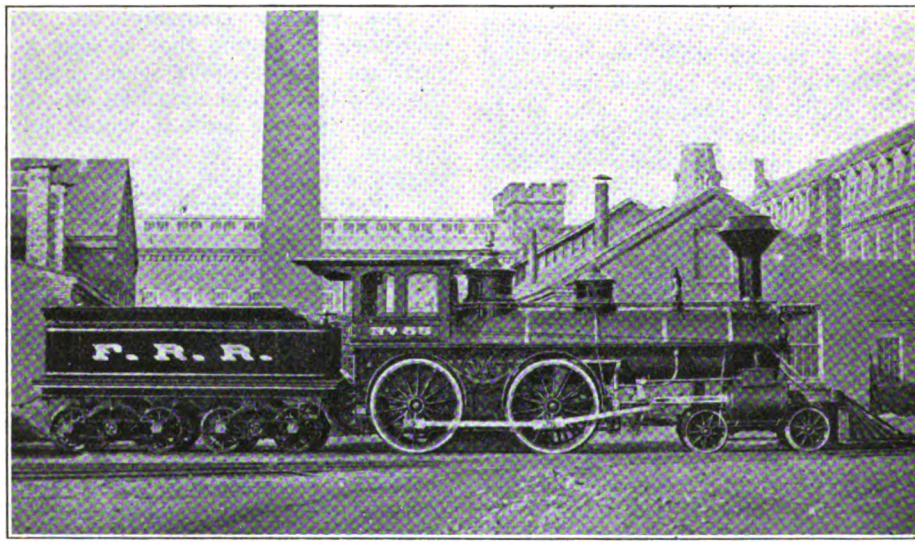
was fitted for burning liquid fuel or a mixture of inferior fuel oil and pulverised low-grade solid fuel, such as inferior slack and smoke-box ashes. No. 966 was equipped for burning low-grade pulverised fuel, the boiler in this case having a firebox specially designed, semi-circular at the base and with a combustion chamber. It is of interest to note that these engines can use 40 per cent. or even more of smoke-box ashes for the pulverised fuel, and the remainder is of very low-grade quality.

In addition to these visits, a party travelled to Guildford to inspect the works of Messrs. Dennis Brothers, while, in the afternoon, other delegates were able to visit the Central and London Trunk Telephone Exchanges. In connection with the Congress, the production of a delegate's or visitor's congress card constituted a voucher covering free travelling facilities during the four days of the Congress over the London County Council, Metropolitan Electric, London United, and South Metropolitan Electric tramway services; also the London General Omnibus Company's services; the various London underground lines and the Metropolitan Railway.

AN AMERICAN 4-4-0 LOCOMOTIVE IN THE 'SEVENTIES.



COMMENTING upon a paragraph appearing in the February RAILWAY MAGAZINE, and to an accompanying illustration showing an old 0-6-6 tank engine, Mr. E. C. Taylor, of Taunton, Mass., U.S.A., sends two photographs of old locomotives built by the Mason Machine works of that town. One of these is reproduced, showing a 4-4-0 in the 'seventies. Mr. Taylor directs special attention to the elaborate painting and brass work which characterised many of the engines built in those days; also the monogram between the driving wheels. The other photograph he sends is of an engine similar to the *Leviathan* illustrated in our February number, but bearing the name *Wm. Mason*. This ran on a line near Taunton, now worked electrically, and forming part of the New York, New Haven and Hartford Railroad. Mr. Taylor mentions that a number of double-boilered locomotives of the "Fairlie" type were built at the Mason Works for a line in Mexico, the most famous being the *Janus*, of which a number of illustrations are available in historical works.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A.M.Inst.T., A.I.Loco.E.

Photo.] [*W. H. C. Kelland.*

LONDON & NORTH WESTERN RAILWAY.

Manchester portion of 11 a.m. ex-Llandudno near Llandudno Junction. 4-6-0 mixed traffic locomotive, No. 81.

AS a sequel to the 25 years of British locomotive practice dealt with in the June issue, it is my desire in the present article to set out the leading locomotive feats of the same period, and especially the extraordinary achievements of the Great Western Railway in the racing which took place between Plymouth and London in the years 1903 and 1904. Of all the record runs made on British soil, two of these feats stand out as unparalleled in the railway history of this country; the first was the run from Paddington to Plymouth which took place on July 14, 1903, when our present King and Queen—then Prince and Princess of Wales—were passengers by the train, and the second was the culminating trip on May 9, 1904, of the astonishing series made in that year from Millbay Docks to London, when the Great Western, with the mails, and the London and South Western, with the passengers off the Transatlantic steamers newly scheduled to call at Plymouth on the east-bound voyage, were engaged in an undisguised race to see who could reach the Metropolis the first. As many readers have probably never yet seen the detailed figures of these runs, I take this opportunity of setting them out in full, as recorded by that expert observer, the late Mr. Charles Rous-Marten, who was a passenger on both occasions. In doing so, and in giving also the average speeds between each station, which at a considerable expenditure of time I have worked out throughout, I am glad to be able to comply with requests received from several quarters for the authentic times that were achieved.

It is difficult to ascertain exactly why the record-breaking achievement embodied in the down journey was attempted. The running of Royal trains is not usually made the occasion of lightning speeds, and it is evident from what has been published subsequently that the running times were in no way pre-arranged, seeing that the express—which was the first portion of the 10.40 a.m. down Cornishman, and carried two coaches for ordinary passengers in addition to the three Royal saloons—arrived at North Road, Plymouth, some 37 minutes ahead of time. Apparently "a good run" had been asked for in high quarters, although no attempt at record-breaking times was actually contemplated, and "a good run" was supplied, in very truth—of a "goodness" so amazing that I often wonder whether it still finds a

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G.W.R. Record Runs, Paddington—Plymouth.

Down: July 14, 1903.	Date.	Up: May 9, 1904.
4-4-0 No. 3433, *City of Bath*.	Engine to Bristol.	4-4-0 No. 3440, *City of Truro*.
	,, from Bristol.	4-2-2 No. 3065, *Duke of Connaught*.
20 axles = 130 tons.	Load to Bristol.	20 axles = 148 tons.
	,, from ,,	16 axles = 120 tons.

Speed.	Time.	Distance.	Stations.	Distance.	Time.	Speed.
M.P.H.	M. S.	M. C.		M. C.	M. S.	M.P.H.
—	0 00	0 0	Paddington	118 57	99 46	42·9
27·0	2 47	1 20	Westbourne Park	117 37	98 01	76·9
54·8	6 05	4 21	Acton	114 36	95 40	81·0
60·5	7 32	5 58	Ealing	112 79	94 35	80·1
65·0	9 02	7 28	Hanwell	111 29	93 22	79·5
66·8	10 35	9 6	Southall	109 51	92 04	78·3
67·3	12 14	10 74	Hayes	107 63	90 39	78·1
69·6	14 13	13 18	West Drayton	105 39	88 53	80·0
72·5	16 42	16 18	Langley	102 39	86 40	82·8
72·8	18 32	18 36	Slough	100 21	85 03	84·2
71·0	21 56	22 38	Taplow	96 19	82 11	86·9
70·5	23 26	24 19	Maidenhead	94 38	80 58	81·5
70·1	29 14	31 1	Twyford	87 56	76 00	75·4
70·9	33 26	35 78	Reading	82 59	72 09	77·9
70·0	35 43	38 51	Tilehurst	80 6	70 06	77·9
72·5	38 07	41 43	Pangbourne	77 14	67 52	76·6
72·3	40 47	44 60	Goring	73 77	65 21	80·5
73·0	43 50	48 37	Cholsey	70 20	62 35	81·1
75·3	47 33	53 10	Didcot	65 47	59 08	82·4
71·6	50 24	56 42	Steventon	62 15	56 40	80·7
71·2	53 40	60 32	Wantage Road	58 25	53 47	81·0
69·8	56 40	63 71	Challow	54 66	51 12	79·1
70·1	58 56	66 43	Uffington	52 14	49 17	75·8
70·5	63 12	71 44	Shrivenham	47 13	45 19	67·2
			*Bridge at 76 m. 74 c. ..	41 63	40 31	21·1
71·6	68 01	77 24	Swindon	41 33	39 37	74·4
71·2	72 44	82 72	Wootton Bassett	35 65	35 06	67·6
76·5	76 31	87 58	Dauntsey	30 79	30 49	74·6
80·5	81 10	93 77	Chippenham	24 60	25 48	69·0
70·0	84 54	98 25	Corsham	20 32	22 01	60·0
76·5	87 41	101 69	Box	16 68	18 28	66·9
76·4	89 55	104 49	Bathampton	14 8	16 00	57·4
64·1	92 02	106 70	Bath¶	11 67	13 38	65·5
57·5	96 42	111 28	Saltford	7 29	9 32	65·6
65·1	98 44	113 59	Keynsham	4 78	7 21	52·3
61·8	101 52	116 77	Bristol East Depot ¶ ..	1 60	3 39	22·6
37·1	pass 104 42	118 57	Pylle Hill Junction ..	0 00 127 66	‡0 00 123 19	— 22·5
34·6	105 21	119 7	Bedminster	127 36	122 19	70·6
54·0	110 46	123 76	Flax Bourton	122 47	118 11	66·2
68·7	112 38	126 8	Nailsea	120 35	116 14	73·4
75·8	115 45	130 3	Yatton	116 40	113 01	74·7
76·4	118 34	133 50	Puxton	112 73	110 08	76·6
75·3	119 32	134 67	Worle	111 56	109 11	75·3
75·3	122 17	138 23	Bleadon	108 20	106 26	75·4
75·8	125 24	142 18	Brent Knoll	104 25	103 18	76·7
75·0	127 36	144 78	Highbridge	101 45	101 09	75·9
73·9	130 40	148 60	Dunball	97 63	98 10	75·8

¶ Severe service Slacks.
* Slack to walking pace for bridge renewal, up journey only.
‡ Actual time standing at Pylle Hill, up journey only, 3 min. 43 sec.

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place in His Majesty's memory. No reader of these pages, indeed, is likely to be under any illusion as to what sort of speeds "a good run" on the Great Western Railway is going to produce.

So, on July 14, 1903, 4-4-0 engine No. 3433, *City of Bath*, set out from Paddington at 6 seconds past 10.40 a.m., with a load totalling 130 tons; Burden was the driver, and Inspector Greenaway was on the footplate. Before the third mile-post had been passed the train was doing a mile-a-minute; 70 m.p.h. was reached soon after West Drayton, "even time" was attained immediately after Slough, and 75 m.p.h. before Reading, where, however, the speed was slightly eased. Between Cholsey and Didcot 77.1 m.p.h. was the maximum speed, and after another slight easing through Didcot, the speed ranged about the "70" mark all the way on to Swindon. On the 1 in 100 of Dauntsey bank 87·4 m.p.h. was reached, and the usual slack through Bath—passed in 2 sec. over 92 min. from Paddington—preceded a much worse one over the Bristol avoiding curve. After negotiating the short rise to Flax Bourton, the engine did better than ever, maintaining a general average of between 75 and 76 m.p.h., over an almost level track, for nearly 20 miles, and touching 83·7 at the foot of the slight descent past Flax Bourton. A careful slack was made through Taunton, after which the Wellington bank, concluding as it does with 1¼ miles at 1 in 90 and a mile at 1 in 81, was breasted without speed falling below 50 m.p.h. Mr. Rous-Marten estimated that three clear minutes might have been cut from the time between Whiteball Summit and Exeter, by a continuation of running of the same order, but the Royal party were then at lunch, and a signal was therefore made to the driver temporarily to keep the speed within more moderate bounds.

Photo.] LONDON & NORTH WESTERN RAILWAY. [*F. E. Mackay.*

Up Irish Mail leaving Willesden Junction. "Claughton" class 4-6-0 engine No. 2450.

Beyond Exeter, which was passed very slowly—in 7½ min. less than the present standard of 3 hours, despite a route 20 miles longer in distance—speed was picked up well about Starcross, but considerable hindrance was offered by the single-line slacks then operating at Dawlish and Teignmouth. The final 1 in 43 of Dainton bank did not bring the engine below 30 m.p.h., nor the 1 in 51 of Rattery below 36, while all the downhill running on the South Devon line, in keeping with the observance of service slacks throughout the journey, was characterised by scrupulous moderation. So the journey of

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245 miles, 49 chains from Paddington to North Road was completed in the extraordinary time of 233 min. 35 sec., all slacks included—13½ min. less than the present "Riviera" time, despite the fact that the latter train travels over a route 70 m.p.h.; the flying average over 101 miles 12 chains from Ealing to Bath was 71·8 m.p.h. and the 157 miles 7 chains from Ealing to Taunton, including the very bad slacks through Bath and Bristol, took 135 min. 7 sec.—a throughout

G.W.R. RECORD RUNS, PADDINGTON—PLYMOUTH.—(*continued.*)

Down: July 14, 1903.			Date.	Up: May 9, 1904.		
4-4-0 No. 3433, *City of Bath.*			Engine to Bristol. / ,, from Bristol.	4-4-0 No. 3440, *City of Truro.* / 4-2-2 No. 3065, *Duke of Connaught.*		
20 axles = 130 tons.			Load to Bristol. / ,, from Bristol.	20 axles = 148 tons. / 16 axles = 120 tons.		
Speed.	Time.	Distance.	Stations.	Distance.	Time.	Speed.
M.P.H.	M. S.	M. C.		M. C.	M. S.	M.P.H.
72·7	132 45	151 22	Bridgwater	95 21	96 10	77·6
72·7	137 31	157 4	Durston	89 39	91 42	71·3
67·4	142 39	162 65	Taunton§	83 58	86 51	78·8
52·1	144 58	164 66	Norton Fitzwarren ..	81 57	85 19	82·7
59·9	150 03	169 72	Wellington	76 51	81 38	72·7
51·5	154 27	173 54	Whiteball Box	72 69	78 31	54·4
			Burlescombe	72 11	77 43	62·0
67·1	158 58	178 58	Tiverton Junc.	67 65	73 32	60·5
70·7	160 57	181 5	Collumpton	65 38	71 13	67·9
67·3	164 39	185 17	Hele..	61 26	67 33	65·8
67·8	165 44	186 35	Silverton	60 8	66 26	63·5
64·7	169 12	190 14	Stoke Canon	56 29	62 54	53·3
60·9	172 34	193 49	Exeter¶	52 74	59 02	43·1
			St. Thomas	52 4	57 49	63·2
47·6	178 32	198 28	Exminster	48 15	54 09	57·4
66·7	181 54	202 8	Starcross†	44 35	50 14	51·1
60·9	185 32	205 63	Dawlish¶	40 60	45 54	43·1
35·8	190 15	208 48	Teignmouth ¶	37 75	41 59	58·9
55·6	195 51	213 63	Newton Abbot¶	32 60	36 42	57·6
41·4	201 28	217 53	Dainton Box	28 70	32 40	57·5
51·3	206 46	222 38	Totnes	24 5	27 39	69·6
41·2	213 24	227 2	Rattery Box			
44·7	216 12	229 29	Brent	17 14	21 43	68·1
51·2	218 45	231 43	Wrangaton	15 0	19 48	59·4
57·4	222 11	234 66	Ivybridge	11 57	16 29	60·9
55·3	224 49	237 21	Cornwood	9 22	14 05	45·3
62·5	226 24	238 73	Hemerdon Box	7 50	11 54	40·2
62·8	228 54	241 48	Plympton	4 75	7 31	57·1
58·5	232 47	245 26	Mutley	1 17	3 36	35·6
21·6	233 35	245 49	Plymouth (North Rd.) ..	0 70	3 07	16·8
			Millbay Crossing	0 0	0 00	—

¶ Severe service Slacks. § Slight service slack.
† P.W. relaying slack near Starcross, up journey only.

20 miles less in distance, and is 2 min. better off in time additionally owing to the absence of tablet-changing slacks at Dawlish and Teignmouth. Between West Drayton and Bathampton, over 91 miles, the speed barely so much as went below average of 69·8 m.p.h. And all this was achieved by a 4-4-0 engine, weighing without tender 54½ tons, or a shade under one-third the total weight of tender and train, with 18 in. by 26 in. cylinders, 6 ft. 8 in. driving wheels, 1818 sq. ft. of heating

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surface and 20·6 sq. ft. of grate, and a working steam pressure of 195 lb. per sq. in.

The up journey was the culmination of a series which had taken place during the previous month. According to the guards' journals, on April 18, 1904, No. 3442, *City of Exeter*, 4-4-0, ran from Millbay crossing to Exeter in 68 min. and through to Pylle Hill in 138 min.; on April 23 the same engine brought these times down to 66 and 136 min.; seven days later No. 3442 stopped at Exeter in the even hour, and then had to come off owing to a defect, whereupon the 7 ft. 8 in. "single" *Sir Richard Grenville* came on at a

[*Photo.*] LONDON & SOUTH WESTERN RAILWAY. [*F. E. Mackay.*

Down West of England Express. 4-6-0 locomotive No. 740.

moment's notice, and ran the 75 miles on to Pylle Hill in 68 min., start-to-stop. On May 2, No. 3440, *City of Truro*, was the engine, and is credited with having passed Exeter in 58 min., and reached Bristol in 128 min., the times by the same engine five days later being 61 and 128 min. respectively. From Bristol to London on these same five dates No. 3396 ran up in 109½ min. on April 18, No. 3056, *Wilkinson*, a 7 ft. 8 in. "single," in 112 min. on April 23, and No. 3065, *Duke of Connaught*, in 99 min. on April 30, 106 min. on May 2, and 110½ min. on May 7; thus the total times from Millbay to Paddington were 4 hours 13 min., 4 hours 12 min., 3 hours 54 min., 3 hours 56 min., and 4 hours 1 min. on the five successive trips, including 5½ min., 4 min., 7 min. (two stops on this trip), 2 min. and 2½ min. standing respectively. Too much reliance need not be placed on these figures, as they are only extracted from journals, the limited value of which is apparent from the fact that, on the journey of May 9, about to be described, the guard was 3¾ min. out in his recorded arrival at Pylle Hill, and 3 min. out in his departure.

Now comes the colossal feat of May 9, 1904, when Mr. Rous-Marten, a traveller by the racing train, was privileged to record the astounding time of 3 hours 46 min., 48 sec. from the start at Millbay Crossing—a good two minutes further off in time than North Road—*via* Pylle Hill Junction at Bristol, where a stop of 3 min. 43 sec. was made, and the Bristol avoiding line to Paddington, a distance of precisely 246½ miles. Included in this time was a slowing to walking pace over the Cricklade Bridge, 30 chains on the London side of Swindon, then under repair, which, it is safe to say, accounted for the odd 46 seconds and another minute as well of the epoch-making time of 99 min. 46 sec. achieved from Pylle Hill, Bristol, to Paddington. The load consisted of five heavily-laden

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postal vans from Plymouth to Bristol, weighing in all 148 tons behind the tender; at Bristol one van was cut off, leaving 120 tons to go forward to London.

West of Newton Abbot the notable feature of the running was the climbing, the time of 4 min. 23 sec. for the 2 miles 55 chains from Plympton up to Hemerdon, over two of which rise at 1 in 42, and 5 min. 1 sec. for the 4 miles 65 chains from Totnes up to Dainton, concluding with over a mile steepening from 1 in 57 to 41, being both figures of extraordinary merit. Though somewhat faster than maximum of 102·3 m.p.h. was reached, the average speed for ½-mile being 100, and for a full mile 96 m.p.h., between Wellington and Norton Fitzwarren—a feat which was all but spoiled by the persistence of certain platelayers in staying calmly on the "four-foot" until the special was nearly on them. It is evident from the times that the engine was eased or slightly checked lower down the bank, and also through Taunton, but high speeds were reached on the level stretch which follows, the time for the 54 miles 47 chains from Whiteball to Bedminster being 43 min.

GREAT WESTERN RAILWAY. BRISTOL-PADDINGTON.

Summary of 26 runs by two-hour up expresses *via* Badminton.
Two-cylinder 4-6-0 engines on all runs. Average gross load (to Reading): 260 tons.

Distances.				Stations.	Schedule.	Average Unchecked Times.					Best Actual Times.				
Point to Point.		Total.				Point to Point.		Total from Bristol.		Average speeds.	Point to Point.		Total from Bristol.		Average speeds.
M.	C.	M.	C.		Min.	M.	S.	M.	S.	M.P.H.	M.	S.	M.	S.	M.P.H.
0	0	0	0	Bristol	0	0	00	0	00	—	0	00	0	00	—
4	64	4	64	Filton Junction ..	9½	10	29	10	29	27·5	9	35	9	35	30·0
12	66	17	50	Badminton	25	15	20	25	49	50·2	13	08	22	43	58·6
17	9	34	59	Wootton Bassett ..	41	15	52	41	41	67·3	14	15	36	58	72·1
5	48	40	27	Swindon	47	5	55	47	36	56·9	5	20	42	18	63·0
24	14	64	41	Didcot	68	21	13	68	49	68·0	19	43	62	01	73·6
17	11	81	53	Reading	*84	15	03	83	52	68·4	13	50	75	51	74·4
11	59	93	32	Maidenhead	*94	10	37	94	29	66·3	10	15	86	06	68·7
5	63	99	15	Slough	100	5	05	99	34	68·3	4	45	90	51	73·1
9	30	108	45	Southall	109	8	36	108	10	65·4	7	45	98	36	72·6
3	28	111	73	Ealing	—	3	08	111	18	64·7	2	48	101	24	72·3
4	38	116	31	Westbourne Park ..	—	4	33	115	51	58·7	4	08	105	32	64·6
1	20	117	51	Paddington ..	120	2	47	118	38	26·9	2	13	107	45	33·8

*NOTE.—The 5 p.m. up, which reduces speed to 30 m.p.h. for slipping a coach in the up platform at Reading, is allowed ½ min. less to Reading and ½ min. more to Maidenhead than above schedule times; other times unaltered.

customary, the downhill speeds were restrained to Newton, where speed was reduced, following which came the single line reductions at Teignmouth and Dawlish, and a bad permanent way slowing at Starcross. After the Exeter slack, fine work was done up to Whiteball, the distance of 20 miles, all but 5 chains, taking 19 min. 29 sec. only. The minimum speed claimed by Mr. Rous-Marten on the 1 in 115 at the summit—62 m.p.h.—is, however, clearly an error, as the average from Burlescombe to Whiteball was only 54·4; presumably 52 m.p.h. was the figure meant. On the Wellington side of the bank Mr. Rous-Marten claimed that a 48 sec., which represents an average speed of 74·8 m.p.h. throughout this distance. Clements was the driver.

But still more amazing work was to follow, when Driver Underhill came on with the 7 ft. 8 in. single driver *Duke of Connaught* at Pylle Hill. The start from the junction round the curve to Bristol East Depôt is as bad as that from Millbay Docks Crossing to North Road at Plymouth, and in this way the starting times of both portions of the run are at a disadvantage; on the second stage the Bath slack was another early hindrance, and the fine subsequent bursts of speed from Corsham to Chippenham and from

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Wootton Bassett to Swindon, after what must have been notable ascents of the two 1 in 100 banks, were again cut short by the drastic slowing over Cricklade Bridge, beyond Swindon. But then, as Rous-Marten writes, *Duke of Connaught* "blazed forth in full glory," achieving a speed performance which, so far as well-authenticated railway records go, is probably without parallel the world over.

On a track practically level throughout, save for the faint descent from Shrivenham to Didcot, averaging about 1 in 800, the 70 miles 24 chains from Shrivenham to Westbourne Park were covered in 52 min. from Temple Meads to Paddington, *via* Bath, would be in the neighbourhood of 97½ minutes! "Such figures," Rous-Marten feelingly wrote, "simply make one gasp"! A further tribute to this amazing performance, if any were needed, is found in the fact that the consumption of coal averaged only 32 lb. per mile from Bristol to London.

But the spirit of Great Western speed enterprise is by no means dead yet, as these columns have from time to time borne witness. Only in December last I was describing a run on the "Cornish Riviera" express, wherein the 4-cylinder

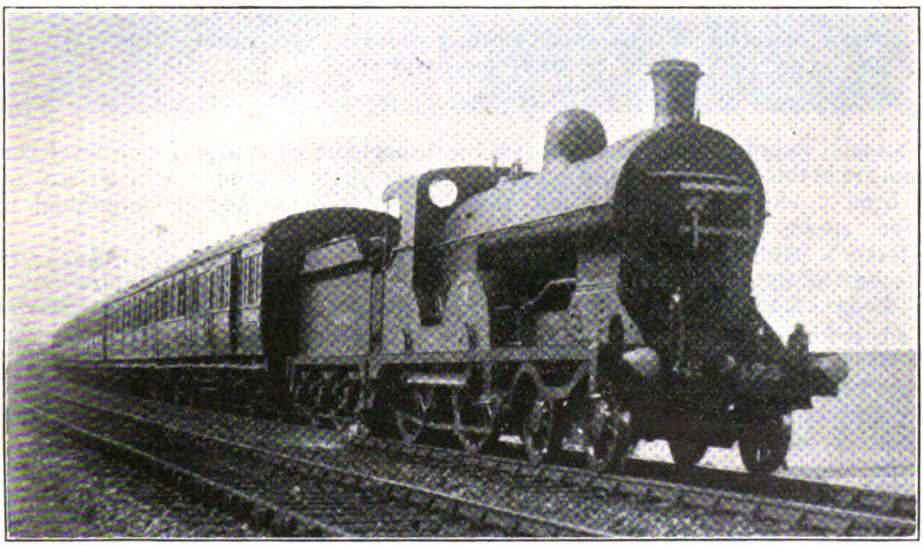

Photo.] GREAT NORTHERN OF IRELAND RAILWAY. [*J. Macartney Robbins.*

Belfast-Dublin Restaurant Car Express near Gormanstown. 4-4-0 superheater locomotive No. 173, "Galtee More."

42 sec., at an average speed throughout of precisely *eighty miles per hour!* The inward times to Paddington from important points *en route* were astounding—from Slough, 14 min. 43 sec.; Reading, 27 min. 37 sec.; Didcot, 40 min. 38 sec.; Swindon, 60 min. 9 sec. gross and about 58¾ min. net; Chippenham, 73 min. 58 sec. gross and 72½ min. net.; Bath, 86 min. 8 sec. gross and 84¾ min. net.; and from Pylle Hill, Bristol, which is ¼-mile further away from London than Temple Meads, and has a worse start by nearly one minute, about 98¼ min. net. Thus the equivalent net time for the 118·3 miles 4-6-0 engine *Lode Star* regained 16 min. of lost time between Westbury and Plymouth, averaging 68·9 m.p.h. over the 65·2 miles between mile-post 122¾ and Exeter with a load some three times that of the racing trains just alluded to. And now there reaches me from an occasional contributor to the RAILWAY MAGAZINE and a valued correspondent—Mr. Humphrey Baker of Bath—whose accuracy of record I well know to be unimpeachable, a log of an up journey made recently on one of the up Bristol two-hour expresses, which is almost worthy to rank with one of these racing trips. It is set out on page 44;

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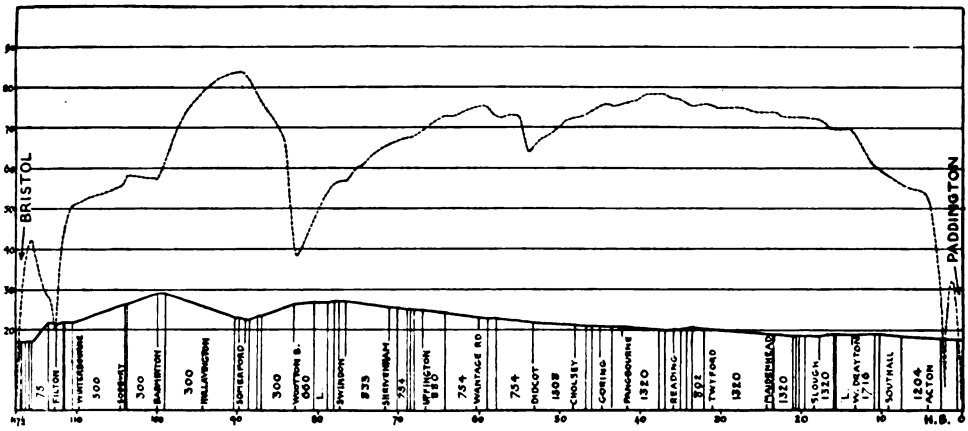

SPEED DIAGRAM OF RUNNING BETWEEN BRISTOL AND PADDINGTON, GREAT WESTERN RAILWAY.

the speeds detailed in the right-hand column are in this case minima and maxima, read from a chronograph, and not the average speeds from point to point. Mr. Baker's carefully-compiled graph of the speed throughout the journey is also reproduced above. The "28¼" m.p.h. marked before Filton, where a p.w.r. slack was experienced, was the minimum on the two miles up at 1 in 75 before that point, but there was a very rapid acceleration up the subsequent 1 in 300, the mile-a-minute rate being almost attained. Then came some first-class travelling on the 1 in 300 down from Badminton to Little Somerford, on which the top speed was 84 m.p.h.; indeed, the rate had not fallen below 70 on the 4¾ concluding miles up of the Badminton line, when steam was shut off for Wootton Bassett, which was passed very carefully, at less than the specified speed, 2 min. before time.

One of these minutes was then lost by a very slow recovery to Swindon, speed not rising above 55½ m.p.h. Even at Shrivenham the rate was only 66, and a slightly lower rate than usual was continued to Didcot, passed only ¾ min. early, where a slight signal check was experienced at Foxhall Junction. But after this all ordinary records went by the board. Mile-posts 49 to 18, a total distance of 31 miles, were run in 24 min. 48 sec., an average—with a 265-ton train-load, twice that of the up racing train—of 75 m.p.h. throughout over a perfectly level course. Posts 78 to 8 were run in 20 sec. under the even hour, and 57 individual miles

Engine: 2-cyl. 4-6-0 No. 2949, *Stanford Court*.
Load: 252 tons tare, 265 tons full.

Distance.	Stations.	Times.	Speeds.
M. Ch.		Min. S.	M.p.h.
0 0	Bristol	0 00	—
1 56	Stapleton Road ..	4 04	28½
4 64	Filton Junction ..	9 55	20¶
7 63	Winterbourne ..	14 02	52
13 5	Sodbury	19 55	58½
17 50	Badminton ..	24 46	56½
23 31	Hullavington ..	29 42	79
27 71	Little Somerford ..	32 59	84
30 50	Brinkworth ..	35 03	76½
34 59	Wootton Bassett	39 01	38½*
40 27	Swindon	45 58	55½
46 7	Shrivenham ..	51 36	66
51 8	Uffington	56 04	70
57 19	Wantage Road ..	61 09	75
61 9	Steventon ..	64 17	73
	Foxhall Junction ..	Signals,	slight.
64 41	Didcot	67 15	—
69 14	Cholsey	71 17	72
72 71	Goring	74 18	76
76 8	Pangbourne ..	76 51	76½
79 0	Tilehurst	79 05	78
81 53	Reading	81 09	78
86 50	Twyford	85 03	76
93 32	Maidenhead	90 28	74
99 15	Slough	95 17	72
		engine	eased.
108 45	Southall	103 47	60
		sig. c	hecks.
117 51	Paddington ..	118 23	—

¶ P.W.R. check. * Service slack.

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Photo.] LONDON, BRIGHTON & SOUTH COAST RAILWAY. [*A. B. MacLeod.*

2-6-0 locomotive No. 1339.

were covered at speeds of 70 m.p.h. or over. The highest speed attained over the Swindon-London length was a sustained 78·2 m.p.h. between posts 40 and 36. As a result of this remarkable speed exhibition, Reading was passed 2¼ min. early, Maidenhead 3½ min. early, Slough 4¾ min. early, and Southall 5¼ min. early, despite the fact that the engine had been eased very materially from Slough eastwards. Maintenance of bare schedule time from Southall into Paddington would have brought the express into London in 114¾ min. from Bristol, 117·6 miles, or 114 min. net, if allowance be made for the Filton and Foxhall Junction

Photo.] SOUTH EASTERN & CHATHAM RAILWAY. [*K. A. C. R. Nunn.*

2-4 tank engine No. 790 at Tonbridge shed.

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checks; and with a normal recovery from Wootton Bassett and a normal finish from Slough this time might have been further cut with ease to 111, if not possibly to 110 min. "Forgive my excitement," my correspondent adds by way of comment, "but I have no one near on whom I can work off these things"!

Only a week ago I saw the same train arrive in Paddington at precisely 1.55 p.m. by the clock, five minutes early. Since then I have received from another correspondent a most interesting document, in the shape of an analysis of 26 journeys by this train and the other two-hour I show a summary of all the *fastest* point-to-point times, with their speed averages. The sum of the former gives the net average running time from Bristol to London, and of the latter what might be considered a minimum "possible" time for the journey.

For the edification of those of my readers who always appear so anxious to hear "the worst," I may say that the trains were on time or not more than ¾ min. late on 11 occasions, including arrivals up to 1¾ min. early; from ¾ to 2½ min. late on eight occasions, 2½ to 5 min. on three trips, once 6 min., once 7 min., once 8 min.

Photo.] LONDON, BRIGHTON & SOUTH COAST RAILWAY. [*C. Laundy.*

Victoria-Tunbridge Wells train near Three Bridges. Old Stroudley 0–4–2 engine No. 174.

express—the 5 p.m. up, which has the disadvantage of an extra slack to 30 m.p.h. at Reading to take the platform line and slip a coach, but carries on the average a load 30 tons the lighter of the two to Reading and 60 tons the lighter on to London. On page 42 I have set out a summary of these journeys, considerations of space forbidding me to set out the details of the 26 runs in full. Of the latter the times were given at the principal points only, corresponding to the timing points in the working book; I have averaged out all the unchecked point-to-point times, and show the average speeds that they represent; then, adjacent and once 9 min. late—an average lateness of 2 min. 2 sec. But when allowance is made for delays, of which a considerable number were experienced, and which work out at an average of 3 min. 34 sec. per trip, the net arrivals work out at 1 min. 22 sec. under schedule time, the worst net loss to engine is 2 min. 3 sec., and six drivers only exceeded their allowances, by an average of merely 52 sec. apiece. And I should mention that I have calculated these net allowances simply by deducting the average time of the unchecked runs over any given length from the time of a checked run, which method takes no account of the brilliant and

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exceptional recoveries from checks which must have been made, judging from the times, on a number of occasions. The true net running times are therefore probably lower than those which I have given.

Let us now briefly examine the times. The schedule allowance of 9½ min. out to Filton appears to be about a minute on the tight side, and even the best time was 5 sec. above the booking. Seeing that the bulk of the distance from Badminton to Wootton Bassett is on falling grades, the "best" average of 72·1 m.p.h. over this length may seem somewhat low, but as the time of 14 min. 15 sec. to which this sec., which, added on to the total unchecked average time of 118 min. 38 sec., brings the figure to exactly two hours.

The sum of the fastest point-to-point times gives a total of 107¾ min., instead of the 120 min. allowed. The times of my friend's exceptional run previously dealt with, *mirabile dictu*, only beat these "best" times over one length—from Reading to Maidenhead—where the margin is the handsome one of 56 sec.; if this were included in the aggregate of "bests," it would bring the figure down to 106¾ min. for the 117·6 miles, start-to-stop, with an average total train-load of 235 tons. From Badminton to Wootton Bassett my

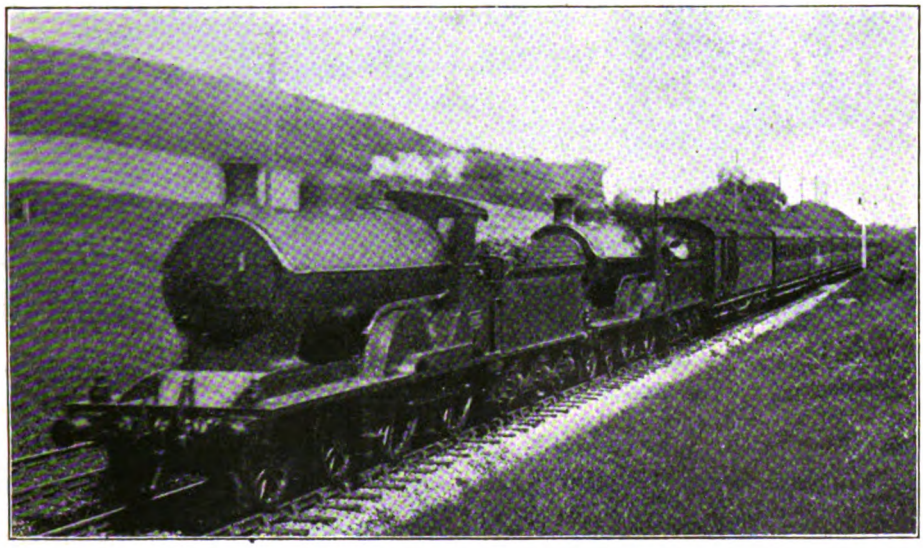

Photo.] GREAT SOUTHERN & WESTERN RAILWAY, IRELAND. [*Rex Murphy.*

Up Mail Train near Rathpeacon. 4–4–0 engines Nos. 307 & 325.

corresponds ties with that made on my correspondent's run last described, it is clear that a maximum rate well over 80 m.p.h. is needed to reach this quickest figure. Average times fit in well with schedule times from Wootton Bassett to Didcot, where the average time is still nearly a minute behind booked time, although the running average speed from Swindon right through to Slough works out at precisely 68 m.p.h. for this distance of all but 59 miles. In all my averages I have treated the Reading slack of the 5 p.m. up, on which seven of the runs were made, as a check; the average loss of time so occasioned works out at 83 friend's time ties with the "best," and from Didcot to Reading it is only 4 sec. behind, inclusive of recovery from the slight Foxhall check. I submit that all these, culled from everyday running, mostly on Saturdays—for these are no cases of "selected" runs—are wonderful figures. The 11 a.m. from Paddington to Bristol may have a higher scheduled speed from start-to-stop, but in view of the greater hindrances on the up journey, I should have little hesitation in describing the up 2-hour expresses, on the basis of their average running speeds, as the fastest daily trains in the world at the present time.

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I had intended to describe certain other record performances of the past 25 years, but considerations of space forbid. Before closing, however, I should like to acknowledge the receipt of a number of unusually valuable communications from various correspondents, on some of which a considerable amount of trouble and thought have clearly been expended. Lest any of my friends should imagine that my failure to reply is an indication of lack of interest in their work, I hasten to say that I have read their letters with the closest attention, and although extreme pressure on my time prevents me from replying personally to the writers, I hope to deal with several of the communications in forthcoming instalments of this article, at the earliest possible opportunity. I will, however, take this opportunity of correcting two minor errors in my last article to which friends have kindly drawn attention. One is that the Caledonian "Dunalastairs" did not actually take part in the Race to Aberdeen of 1895, but were really the fruit of it, appearing as they did in 1896, and making themselves famous on the very fast night Scottish expresses of that year. The other concerns the date of Mr. F. W. Webb's retirement from the post of Chief Mechanical Engineer to the London and North Western Railway, which, a correspondent rightly claims to have taken place in 1903; inadvertently I confused this date with 1906—the year of his death.

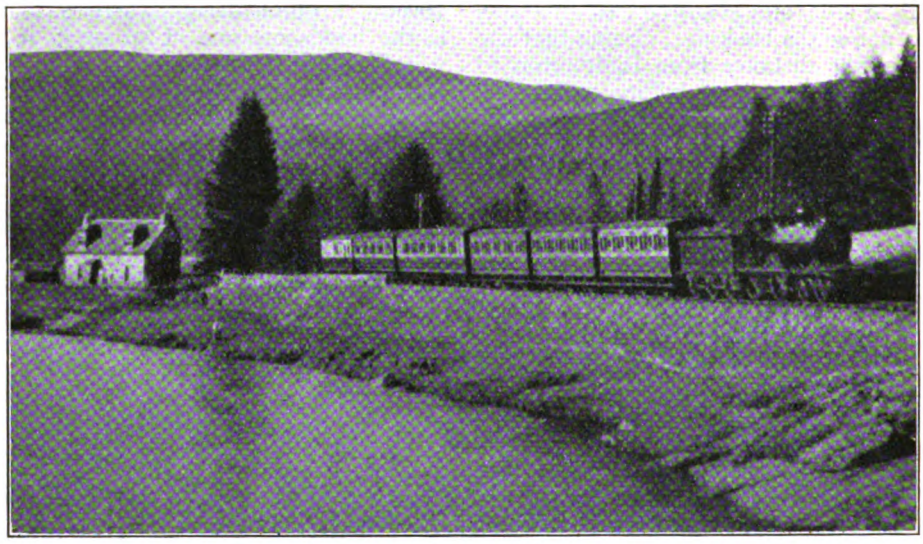
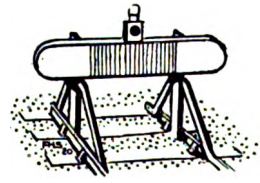


Photo.] **GREAT NORTH OF SCOTLAND RAILWAY.** [*W. A. Millar.*

Ballater–Aberdeen train near Cambus O'May.



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4-6-4 Main Line Tank Engines, Glasgow and South Western Railway.

BY courtesy of Mr. Robert H. Whitelegg, Chief Mechanical Engineer, Glasgow and South Western Railway, we are enabled to illustrate as frontispiece, one of six new 4-6-4 superheater tank engines—Nos. 540–545—designed by him and constructed at the Hyde Park Works of the North British Locomotive Company, Limited. They are intended mainly for dealing with the heavy fast and ever-growing traffic of the various coast routes serving the numerous popular holiday resorts of the Ayrshire coast and in connection with the Clyde steamer services, both by railway-owned and by private vessels. The engines are also being used for Anglo-Scottish trains between Glasgow and Kilmarnock, a very steeply graded section, and have, we understand, been tested on the Glasgow-Ayr non-stop expresses, booked to cover the 41 miles in 50 min.

In designing these engines the aim of the designer has been to incorporate all the best features of the Company's existing tender engines, with the advantages of a double-ended tank engine, wherein the weight of fuel and water is all available for increasing the adhesive weight and hence the tractive effort. They are fitted with the "Robinson" superheater of 21 elements, with circulating device and header discharge valve, and work up to a superheat of 650° Fahr. The valve motion is of the Walschaert type, the connecting rods being fitted with "Skefko" ball bearings, operating piston valves of Allen and Simmonds, Limited, Reading, patent type, which piston valves are fitted with Robinson patent pressure relief valves. The reversing of the engine is effected by a steam reverser To facilitate handy manipulation of the engine when running either backward or forward, all the operating levers, namely, regulator, vacuum brake valve, whistle, sand gear, have duplicate handles on either side of the footplate. The engine is fitted with an automatic ash ejector in the smoke-box. As the paint usually burns off locomotive boilers of high pressure, the boilers of these engines are clothed with blue planished steel and are very easily kept clean. These engines have only been at work a few weeks but are working most successfully and quite justify the advent of this type of engine into Scotland Their capabilities, so far as quick starting, acceleration, and high speed running, and especially the facility with which they handle very heavy trains, are very marked.

LEADING DIMENSIONS.

Cylinders	22 in. × 26 in.
Coupled wheels	6 ft. diam.
Bogie wheels	3 ft. 6 in. diam.
Wheelbase, rigid	13 ft. 2 in.
Wheelbase, total	39 ft.
Heating Surface.—	
Large tubes	442 sq. ft.
Small tubes	1,132 ,, ,,
Firebox	156 ,, ,,
Total evaporative	1,730 ,, ,,
Superheater elements	255 ,, ,,
Total surface	1,985 ,, ,,
Grate Area	30 sq. ft.
Working pressure	180 lb. per sq. in.
Tractive effort in lb. at 85 per cent. boiler pressure	26,741
Water in tanks	2,400 gall.
Coal	3½ tons

	Weight in working order. Tons	Cwts.	Qrs.
Leading bogie	21	6	0
Leading wheels	18	0	0
Driving wheels	18	0	0
Trailing wheels	18	0	0
Hind bogie	23	15	2
Total	99	1	2

A test run was recently made with one of these new engines on a return trip between Glasgow and Carlisle, a total running distance of 233 miles, the train being composed of passenger carriages of the standard corridor type.

Space will not permit of the gradients being reviewed in detail, but they will be

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generally familiar to readers of the RAILWAY MAGAZINE. Sufficient then, to emphasise the severity of those between Glasgow and Kilmarnock, and the long climb to New Cumnock, both from Kilmarnock and from Dumfries. There is little to choose between the north and south bound journeys in regard to the demands placed upon the locomotives.

The train was timed to leave St. Enoch at 11.0 a.m., the total weight behind the engine being 310 tons, and the engine provided to work the train was No. 544.

Starting at time, Kennishead was passed in 8·2 min., and Barrhead, 7½ miles from St. Enoch, in 12 min., an average speed of 37½ miles per hour. Lugton was reached 24¾ min. and Dunlop 27½ min. from the start, or 15½ min. for a distance of 9 miles, representing an average speed of 35 miles per hour on this section with rising gradients of 1 in 100, 1 in 67, 1 in 69, and 1 in 70. From Dunlop to Kilmarnock, all down-hill, the average speed was 53·7 miles per hour, the 7¾ miles being covered in 8·66 min., and Kilmarnock reached at 36·16 min. including a signal check at Bonnyton Cabin about half-a-mile from Kilmarnock station.

After taking water, Kilmarnock was left at 11–42¼ with a load of 340 tons behind the engine. Hurlford, about 2 miles from Kilmarnock, was passed in 3·82 min.; Mauchline in 16·21 min., and New Cumnock was reached and passed in 30¼ min., an average speed of 40 miles per hour with rising gradients of 1 in 100, 1 in 99, 1 in 105, &c. From New Cumnock to Carronbridge, a distance of 19½ miles, took 21 min., and to Holywood, about 14 miles, took 13½ min. equal to an average speed of 55·7 and 62·2 miles per hour for the respective distances. From Holywood to Dumfries, 3·4 miles, took 4·82 min. including signals at Cairn Valley Junction, the average speed being 45·3 miles per hour, arriving at Dumfries at 12·52 p.m. The engine again took water here.

The load was further augmented at Dumfries, and amounted to 440 tons behind the engine, the starting time being 1.2¾ p.m. Ruthwell was passed in 13·1 min. for the 8·5 miles, speed 39 miles per hour, and Annan, 7 miles, in 7¼ min., 57·93 miles per hour. From Annan to Gretna Junction, 8·86 miles, took 9¼ min., equal to 57·4 miles per hour, and from Gretna Junction to Carlisle, 8·7 miles, took 11 min. including slows for stopping, an average of 47·45 miles per hour for the last section of this journey. The booked journey time, that is the overall time between St. Enoch and Carlisle, was 166 min., and the actual time taken was 165 min. The time allowed for the Kilmarnock and Dumfries stops was 19 min.—Kilmarnock 11, Dumfries 8—but the time actually taken at these stations was 16.84 min., so that in actual running time 1·16 min. was lost in the through journey.

The return journey from Carlisle, with a load of 440 tons behind the engine, proved just as interesting as the outward journey. Starting at 3.49, Gretna Junction was passed in 12¼ min. Gretna Junction to Annan took 11.7 min., an average speed of 44·1 miles per hour for the 17·6 miles between Carlisle and Annan; to Ruthwell, 7 miles, took 7·6 min., and Dumfries, 8·48 miles, 9·45 min., the total distance between Carlisle and Dumfries taking 41½ min. for the 33 miles, the average speed being 47·7 m.p.h. for the section, arriving at Dumfries at 4·30½. Engine took water and train left at 4–38.1. The load leaving this station, for the long climb of 38 miles to New Cumnock, was reduced to 325 tons, and Holywood, 3·4 miles, was passed at 4–44.41 or 6¼ min. from starting; Auldgirth passed in 5 min., and to Closeburn took 4·83 min., or an average speed for the first 10·46 miles of 39·2 miles per hour on rising gradients. Closeburn to Thornhill, 2·47 miles, took 3¾ min., and Carronbridge, 3·32 miles, was passed in 5·07 min.; a signal stop at Ardoch was responsible for 6½ min., and Sanquhar, 8½ miles from Carronbridge, was reached in 17·3 min. including time at Ardoch, or 10·8 min. for 8·6 miles, equal to an average speed for the distance of 47·7 miles per hour. From Sanquhar to Kirkconnel, 3¼ miles, took 4·83 min., and the next 7½ miles to New Cumnock took 8 min., an average speed for the latter distance of 56¼ m.p.h. From new Cumnock to within half-a-mile from Kilmarnock the gradients are almost all falling and in favour of down trains; the distance from New Cumnock to Kilmarnock is 21·3 miles, and excluding 3¼ min. stop at Hurlford No. 2 cabin for signals, took 24·6 min., the average speed being 51·91 m.p.h.

The actual running time from Dumfries

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to Kilmarnock was 73·08 min., or 2·08 min. over the booked time, which, considering the stops at Ardoch and Hurlford No. 2 cabin when the train was travelling at speeds of 54 and 60 m.p.h. respectively, shows remarkably good work with this heavy load, and it is quite reasonable to suggest that, had these stops not occurred, the running time would have been as many minutes under as over the booked time. The average speed from Dumfries to Kilmarnock was 47·75 m.p.h. Arrived Kilmarnock at 6.1 p.m., water was taken and load increased to 360 tons.

Leaving Kilmarnock at 6.11 p.m., Dunlop, 7·66 miles, took 15½ min., and the 5·4 miles to Shilford Cabin took 7·6 min., equivalent to average speeds of 29 and 42·9 m.p.h. respectively. From Shilford cabin to St. Enoch the gradients are all falling and Neilston was passsed in 1¾ min., Barrhead 2·16 min., Pollokshaws 3·85 min., and St. Enoch 7½ min., the total distance, Shilford cabin to St. Enoch, 11·25 miles, being covered in 13·9 min., the average speed being 48·5 m.p.h. The highest speed attained on the outward journey was equal to 69 m.p.h., between the 20th and 21st milepost, and on the return journey 69 m.p.h., between the 86th and 87th milepost from Carlisle.

Throughout, this experimental or trial run was most interesting, particularly from a locomotive standpoint. While strict observation was not kept on the relative positions of the regulator handle and reversing gear in respect to the contour of the road, the enginemen handled the locomotive in a most efficient and capable manner, and considering they had not previously worked this class of locomotive over the main line, it would be quite fair to deduce that, with another like opportunity, much better results would be obtained. Careful measurement was made as to the coal and water consumption, the coal average being 60½ lb. per train-mile, or 166 lb. per 1,000 ton-miles equal to ·166 lb. per ton mile. With experience on the part of the firemen this is being steadily reduced. The water consumption on the journey between Kilmarnock and Dumfries equalled 26·77 gall. per train mile, and on the return journey on same section 33·17 gall. per train-mile, the difference being accounted for by the longer uphill journey, equalling 15½ miles more between Dumfries and New Cumnock than between Kilmarnock and New Cumnock.

One of the principal objects in making these trial runs was with a view of ascertaining to what extent the use of a more powerful type of locomotive on these important Scotch expresses would eliminate the use of a pilot engine, and the following schedule of loads permitted at present for one engine over the several portions of the line will serve to demonstrate how far the new locomotive has been successful in this respect.

SCHEDULE OF ENGINE LOADS.
Glasgow and Carlisle, and Vice Versa.

	Tons.
Glasgow to Kilmarnock	225
Kilmarnock to Dumfries	255
Dumfries to Carlisle	335
Carlisle to Dumfries	335
Dumfries to Kilmarnock ..	240
Kilmarnock to Glasgow	270

It should be noted these engines were designed chiefly for dealing with the fast and ever growing heavy passenger traffic between Glasgow and the popular coast resorts served by the Glasgow and South Western Railway, viz :—Troon, Prestwick, Ayr, Girvan, Ardrossan, Largs and Fairlie, and the whole of the batch of six engines have been regularly engaged on these services since they were delivered from the builders. It is interesting to note that Mr. Whitelegg was the originator of this form of heavy and powerful express locomotive in Great Britain, having designed some for the Tilbury Section of the Midland Railway in 1912. These latest engines on the Glasgow and South Western Railway rank as the first of the type in Scotland, and about the most powerful tank locomotive in Great Britain.

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Summer Train Services. [No. I.]

Many Notable Developments Characterise the Main Line Services of the Leading Railways, and Numerous Additional Facilities have been arranged.

LAST year's summer traffic arrangements realised a good approximation to pre-war facilities, and would have been better had it not been for the coal strike which disorganised matters so seriously during the months immediately preceding. In October the Great Western Railway did, in actual fact, restore virtually pre-war time-tables, as operated during the autumn and winter months, including the continuance of a few facilities which had previously been regarded as justified only during the ordinary holiday period. Other railways, while not professedly returning to pre-war schedules, then and in the earlier months of this year also improved their principal services, so that, allowing for the retention of certain stops where longer non-stop journeys had previously been made, and the loads, really called for pre-war standards of locomotive performance. Concurrently many new through carriage facilities were arranged, notably those between Aberdeen and Penzance, and Edinburgh and Southampton, most of the few pre-war cross-country services of various kinds which had not already been restored finding a place once more in the time-tables.

The way was thus prepared for an ambitious programme for the summer of 1922, and from particulars so far available, anticipations of "great things" will be fully realised. Many of these will not eventuate until the July time-tables, effective in most cases about the 10th of that month, and it is too early, at the time of writing, to cover them fully. In many instances, however, information is now available, while considerable interest attaches to many of the "Earlier Holidays" arrangements during June and early July, and in the following section the principal developments of which particulars can yet be given are set forth briefly. The remainder will be dealt with under the same heading next month.

Caledonian Railway.

In July there will be an almost complete return to pre-war services. The midday express from Aberdeen, &c., to Glasgow will be duplicated from Perth, the Inverness and Dundee portion leaving at 3.5 p.m., and the Aberdeen portion at 3.16 p.m. The "Grampian" corridor express from Aberdeen, &c., will also be duplicated from Perth, the first section leaving at 7.45 p.m., and running to Buchanan Street, and the Aberdeen portion at 8.0 p.m., running to the Central Station in Glasgow. In connection with the Highland Railway, the up sleeping-car express will leave Inverness at 4.30 p.m., Oban 5.30 p.m., and Perth 9.10 p.m., being due in London at 7.40 a.m. On the Down journey, the Inverness and Oban sleeping cars will be run separately from the Aberdeen portion, and both sections are to be timed to leave Euston at 7.30 p.m. The Inverness portion will run non-stop from Carlisle to Perth, except for a call at Stirling to detach the Oban vehicles It will be due at Perth at 5.5 a.m. The Oban vehicles will travel with the West Highland mail train leaving Stirling at 6.0 a.m.

A new feature is a Pullman car service from Glasgow to the Highland line, conveying by the 10.10 a.m. from Buchanan Street a car running as far as Aviemore, returning from there attached to the 3.30 p.m. train from Inverness. The 1.30 p.m. from Buchanan Street will be divided, the first portion conveying the Aberdeen and Inverness vehicles, and the second at 1.40 p.m., forming a Callander and Dundee express. The Up and Down postal trains have already been restored virtually to pre-war standards, including the run of the Up train between Forfar and Perth—32½ miles in 34 min., average 57 m.p.h.

The Loch Awe steamer and the motors between Oban and Ford are now worked by the Caledonian Company, and the popular Loch Awe tours will be resumed in July. The steamers on Loch Tay are also under the management of the Caledonian Company, and the Loch Tay tours will also be restored.

Numerous additions are made to the services on the various holiday and residential traffic routes, also to train and steamer facilities on the Clyde, to the Isle of Man via Ardrossan and on Loch Lomond.

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GLASGOW AND SOUTH WESTERN RAILWAY.

The special feature of the new summer arrangements this year is the large number of connections now made between the Anglo-Scottish trains—increased and accelerated as set forth in the Midland Railway section—and the coast lines, in order to serve the various Clyde steamer services via Greenock (Prince's Pier), Ardrossan, Fairlie, &c., and including private steamers as well as those railway-owned. Among the trains which now have a full series of such connections, some of which are new developments, are the 9.30 and 11.45 p.m. from St. Pancras, and the 4.25 a.m. (10.18 a.m. from Leeds), from London; also in the opposite direction, the 9.25 a.m., 12 noon, 5.30 and 9. 20 p.m. from St. Enoch to the south.

Commencing June 1, the coast services were supplemented by the usual summer connections, including the daily evening service to Rothesay and the Kyles of Bute by the 4.3 p.m. from St. Enoch, and the daily evening service to Arran by the 4.55 p.m. from St. Enoch, and the re-introduction of steamer services via Fairlie Pier. Additions have also been made to the trains running in connection with the steamers as a whole, also on the Ayrshire lines, including the 9.35 a.m. golfers' train from Glasgow to Ayr, which now runs on Tuesdays and Thursdays as well as on Saturdays. The services to and from the Isle of Man, via Ardrossan, were resumed on June 12, and tickets and cheap fares are this year available from principal stations to the Isle of Man. Tourist and excursion arrangements between Scotland and England apply from June 1.

GREAT CENTRAL RAILWAY.

The new facilities which become operative from Monday, July 10, include a large number of "Sea to Sea" expresses, covering practically all those with which this company was associated in pre-war days and others since added, including the services from Liverpool to Hull, Yarmouth and Harwich, Newcastle to Bournemouth and Portsmouth, and to Cardiff and Swansea, and the Aberdeen-Penzance service, to which a Glasgow connection is to be given. Among various developments may also be noted the 10.30 a.m. express from York to Bournemouth, re-timed to leave at 10.13 a.m. and giving a connection from Bridlington at 9.10 a.m.; the extension of the 7.36 a.m. restaurant car express from Southampton to York to run through to Scarborough, with a connection at Burton Salmon for Bridlington; a new dining car train between Sheffield and Oxford, Bath and Bristol, calling at Chesterfield, Nottingham, Leicester and Rugby, leaving Sheffield at 8.55 a.m., and, in the opposite direction, Bristol at 9.35 a.m.; and the 3.0 p.m. York-Southampton train will start from Scarborough at 1.20 p.m. A new restaurant car service is provided from Mansfield at 8.12 a.m., due in London at 11.10 a.m., the return service leaving Marylebone at 4.55 p.m. These trains bring Mansfield within a three hours' journey of London. The popular through services between Leeds and Wakefield and Grimsby and Cleethorpes are resumed. An entirely new restaurant car service will this year leave Liverpool at 11.5 a.m., connecting Warrington, Manchester, Sheffield, &c., with Yarmouth and Lowestoft. The return train will, commencing July 11, leave Yarmouth at 12.10 p.m. and Lowestoft at 12.0 noon. The restaurant car boat expresses between Liverpool, Manchester, Sheffield, &c., and Harwich will be continued throughout the summer. A number of existing trains will be altered slightly and in some instances accelerated. Thus, the 6.20 p.m. London-Bradford express will be due at Sheffield at 9.33 p.m. and Bradford at 11.17 p.m.

GREAT EASTERN RAILWAY.

The principal novelty is the resumption of the running of express trains from and to St. Pancras. From July 24 to September 16, inclusive, a dining car express will leave St. Pancras at 11.20 a.m., running without stop to Cambridge, due 12.34 p.m. and thence calling only at King's Lynn and Heacham to Hunstanton, due 2.8 p.m. The return train will leave Hunstanton at 1.5 p.m. and be due at St. Pancras at 4.2 p.m. Commencing July 10, among the additional and accelerated trains affecting Cambridge line services, may be noted the 6.33 p.m. from Ely to Hunstanton in connection with the 4.45 p.m. from Liverpool Street; a through restaurant car service (July 10 to September 9, inclusive) from Liverpool (Central) at 11.5 a.m., Manchester (Central) 12.0 noon, and Sheffield 1.21 p.m. for Yarmouth and Lowestoft, with connections with other services; and the corresponding return train (July 11 to September 11, inclusive) from Yarmouth (Vauxhall) 12.10 p.m. and Lowestoft (Central) 12.0 noon. Additional and accelerated services will also be provided between Peterborough and Yarmouth and Lowestoft, while from July 10 to September 11, inclusive, an express will run between Peterborough and Hunstanton, leaving the Great Eastern station at 11.40 a.m. and reaching Hunstanton at 1.17 p.m., this train being in connection with trains of the Great Northern, Midland and London and North Western Railways at one or other of the two Peterborough stations. The return train will leave Hunstanton at 12.44 p.m. for Peterborough.

On the Colchester line the 8.15 a.m. from Liverpool Street to Cromer will give a new service from Ipswich to Beccles, Yarmouth and Lowestoft. The present 10.0 a.m.

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restaurant car express will be replaced by a Cromer, Sheringham and Mundesley, &c., train at 9.50 a.m., and a Yarmouth, Gorleston and Lowestoft express at 9.55 a.m., calling first at Beccles, an Ipswich stop being added, commencing September 18. The 12.25 p.m. from Liverpool Street to Norfolk Coast resorts will resume its non-stop run to North Walsham, with restaurant cars to Cromer and through facilities to Sheringham, Mundesley-on-Sea and Overstrand. The 12.30 p.m. from Liverpool Street to Yarmouth and Gorleston will be non-stop throughout. Restaurant cars will be provided and the train will run until September 16. The 12.56 p.m. will be an express for other services there will also be additions and accelerations.

GREAT NORTHERN RAILWAY.

A number of important improvements will be made in the Angle-Scottish and North East coast services, the majority operating from Monday, July 10, though some will come into force at earlier dates, as indicated. The 10.0 a.m. express from King's Cross will again be relieved by the 9.50 a.m., calling for passenger traffic at Doncaster and Newcastle only to Edinburgh, the second part, at 10.0 a.m., taking passengers for Glasgow, Perth, Aberdeen, &c. An additional express will be again provided from King's Cross at 11.20

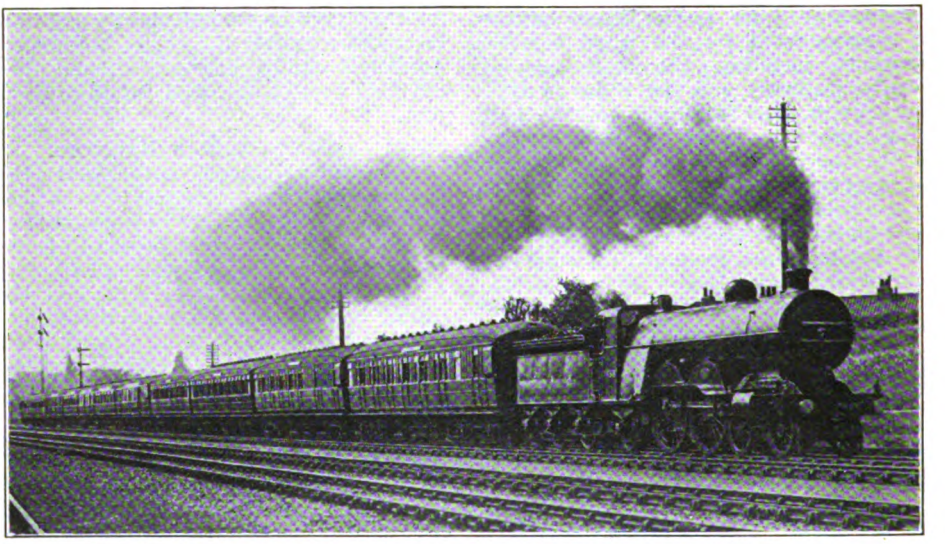

Photo.] GREAT NORTHERN RAILWAY. [*F. E. Mackay.*

10.10 a.m. King's Cross—Leeds Restaurant Car Express (including a set of "articulated" vehicles) near New Southgate. 4-4-2 superheated locomotive No. 1458.

Felixstowe and Lowestoft only, with restaurant cars to Lowestoft. After September 16, this train will have a connection from Beccles to Yarmouth and Lowestoft. In the opposite direction the 12.25 p.m. from Sheringham and 12.50 p.m. from Cromer will be non-stop from North Walsham to Liverpool Street. There will be a special express from Lowestoft at 1.5 p.m., with connection from Gorleston-on-Sea, and 1.36 p.m. from Felixstowe to Liverpool Street. The 1.25 p.m. from Yarmouth (South Town) will be non-stop throughout to Liverpool Street. while the 4.22 p.m. from Yarmouth and 4.25 p.m. from Lowestoft will be non-stop from Beccles (stop for connecting purposes only) to London, restaurant cars being provided from Yarmouth. On the Clacton and Walton and a.m. From July 3 the sleeping car express leaving King's Cross at 7.30 p.m. will be accelerated to reach Perth at 5.10 a.m., Inverness 9.25 a.m., 25 and 50 min. earlier, respectively, than at present. This train will also run on Sunday nights, commencing July 16. The up express from Edinburgh at 10.0 a.m. will cease to call at Grantham, running non-stop from Doncaster to King's Cross. The 1.30 p.m. from Edinburgh will call at Doncaster to make connections for Sheffield, Manchester, &c., and to enable passengers to transfer to trains for intermediate stations between Doncaster and Retford. It will, however, still be due at King's Cross at 10.0 p.m. Commencing July 3, the sleeping car express leaving Inverness at 3.30 p.m. will start at 4.30 p.m.,

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calling at Perth at 9.0 a.m., instead of 8.5 p.m., and be due to reach King's Cross at 7.30 a.m., the throughout journey being accelerated by one hour.

In regard to coast resorts on the North Eastern system, a restaurant car express will be provided from King's Cross at 5.35 p.m. for York, Middlesbrough and Stockton, West Hartlepool and Sunderland, the arrival at the last-mentioned place being 11.34 p.m. The 5.30 p.m. express in advance of this will make its first stop at Doncaster. In the opposite direction a new luncheon car express will be provided from Sunderland at 7.8 a.m., serving West Hartlepool, Stockton, Middlesbrough and York. Commencing June 12 a new connection to Woodhall Spa will be given off the 4.0 p.m. train from King's Cross, by which the Lincolnshire Inland Spa will be reached in 3½ hours. A through carriage for Halifax will be attached to the 5.45 p.m. from King's Cross, due 10.7 p.m. New express services will be provided between King's Cross and Lincoln, the 1.50 p.m. down train giving an arrival at 4.45 p.m., while the up train will leave Lincoln at 3.55 p.m. and be due in King's Cross at 6.45 p.m.

London and South Western Railway.

The Paris service has been considerably improved, the departure time now being 7.40 p.m. instead of 5.0 p.m., a reduction of more than 2½ hours on the journey. The Cherbourg service was reopened for the summer on Friday, June 2, outward on Monday, Wednesday and Friday, and homeward on Tuesday, Thursday and Saturday. On June 18 the summer time-tables came into operation, but principal developments will operate as from July 10. Through trains will then be provided from Brighton, Worthing and Chichester to Portsmouth, Eastleigh, Salisbury, and thence by the Great Western Railway to Bath, Bristol, Cardiff, &c.; also to Brighton, Worthing and Chichester from Portsmouth, Salisbury, Exeter, Barnstaple and Ilfracombe. In conjunction with the South Eastern and Chatham Railway, a new through train will run from Dover and Folkestone via Guildford to Southampton and Bournemouth. There will also be through services from Manchester, Newcastle, York, &c., to Southampton and Bournemouth, and Portsmouth to Cardiff, Bristol, &c.

The usual division (from July 14) of the 11.0 a.m. ex-Waterloo into three trains at 10.0, 11.0 a.m. and 12.0 noon together serving the West of England resorts is again made, but west of Exeter some of these are accelerated, notably on the Plymouth route. On the Bournemouth line the hourly service will be continuous, from 8.30 a.m. until 7.30 p.m., the 10.30 a.m. and 2.30 p.m. being added as 2¼-hour trains between Waterloo and Bournemouth (Central), the corresponding additional up trains leaving the latter station at 12.35 and 4.35 p.m. On the Portsmouth route also additional trains are to be provided, especially on Saturdays.

London, Brighton and South Coast Railway.

Commencing June 12, a number of additional trains were brought into operation, of which the following may be noted :—Down : 11.40 a.m. London Bridge to Brighton ; 1.20 p.m. London Bridge to Angmering, and 1.48 p.m. Victoria to Brighton, all Saturdays only ; 5.55 p.m. London Bridge to Littlehampton and Bognor via Worthing (Saturdays excepted), and (on every weekday) 1.55 p.m. Victoria to Angmering, 4.5 p.m. London Bridge to Seaford, 4.30 p.m. Victoria to Lewes and Eastbourne, and 8.5 p.m. Victoria to Crowborough and Uckfield. Up : 6.43 a.m. Angmering to London Bridge ; 7.18 a.m. (not Mondays) Bognor to Victoria ; 9.0 a.m. Forest Row, and 9.15 a.m. East Grinstead, to London Bridge ; 3.30 p.m. (Saturdays only) Brighton to Victoria ; 5.33 p.m. Worthing to Victoria ; 7.30 p.m. Hastings to London Bridge, and 7.50 p.m. Eastbourne to London Bridge. On the branch and coast lines a number of additional trains are also provided.

On Sundays many new trains are provided, including the 8.35 a.m. Victoria to Littlehampton and Bognor ; 10.30 a.m. Victoria to Worthing ; 10.38 a.m. Brighton to Lewes, connecting with the 10.0 a.m. Continental train from Victoria ; 11.15 a.m. Victoria to Seaford ; 6.0 p.m. Bognor and Littlehampton to Victoria, and 6.20 p.m. Worthing to Victoria. Numerous ordinary trains have been accelerated and improved.

Midland Railway.

Many additions came into force on May 1, some of which are also dealt with in sections devoted to the North British and other railways. Including these and other principal additions for the summer months, the following may be noted :—

The 9.20 a.m. Glasgow to St. Pancras leaves at 9.25, and is accelerated to arrive at St. Pancras at 6.35 p.m. ; the 9.15 a.m. Edinburgh to St. Pancras leaves at 9.45, and is due at St. Pancras at 7.10 p.m. ; the 10.18 a.m. Leeds to Edinburgh and Glasgow is accelerated to arrive at Edinburgh at 3.54 and Glasgow at 3.40, giving connections at Glasgow for the Clyde resorts ; the 4.30 p.m. Glasgow to Leeds leaves at 5.30 and arrives at Leeds at 11.50, in connection with a new express to the West of England leaving Leeds at 12.5 a.m., through carriages

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being provided from Edinburgh and Glasgow to Bristol.

There are also new expresses at 11.50 a.m. from St. Pancras to Edinburgh (Waverley), calling at Leicester, Sheffield and Leeds, and 10.35 a.m. Edinburgh (Waverley) to St. Pancras, calling at Hellifield, Leeds, Sheffield and Leicester, both with restaurant cars throughout.

Between London, Manchester, Liverpool, Leeds, &c., on the West of England line, many additions and accelerations are included.

Commencing July 1, the 12.8 p.m. York to Sheffield will be extended to Birmingham on Mondays, Fridays and Saturdays, and from July 10 trains will run at 9.30 a.m. from Birmingham to York and Scarborough, and at 2.45 p.m. from Scarborough to York and Birmingham.

For Morecambe and Lake District traffic the 8.7 p.m. Leeds to Hellifield is extended to Morecambe, the 8 a.m. Lancaster to Skipton is extended to Bradford, the 8.38 a.m. Carnforth to Leeds leaves at 8.33 and connects at Leeds with the 10.47 a.m. through train from Leeds to Torquay, and a train is provided on Mondays at 8.53 a.m. from Leeds to Hellifield and Morecambe. Commencing July 10 (Wednesdays and Thursdays excepted), trains will be added at 12.48 p.m. Leeds to Carnforth, and 12.5 p.m. Carnforth to Leeds.

For Norfolk Coast traffic new expresses will run from July 10 at 10.38 a.m. from Nottingham and 10.45 a.m. from Leicester to Yarmouth, and at 2.45 p.m. from Yarmouth to Nottingham, Leicester and Birmingham. Through trains are again run between the Midland system and Harrogate at 4.25, 9.50, 11.50 a.m., and 5 p.m. from St. Pancras, and at 8.58 a.m. and 12.3, 3.5 and 5.10 p.m. from Harrogate, with through coaches on the two last down trains and the two first up trains. Sailings between Heysham and Douglas will commence on June 30 and continue until September 25, leaving Heysham at 10 a.m. and Douglas at 4 p.m. There are also numerous additions, both now and in July, to services to and from Southend, Scarborough and other holiday centres served by the Midland Railway and by lines in connection.

North British Railway.

The "Lothian Coast" expresses, between Glasgow, North Berwick and Gullane; the Edinburgh "Fifeshire Coast" expresses between Edinburgh and the East Fife watering places, and the Glasgow and Fifeshire expresses between Glasgow and the East Fife watering places, were re-introduced on June 1, while the Peebles-shire expresses between Edinburgh and Galashiels via Peebles, with through carriage also to and from Broomlee, the station for West Linton, were brought into operation in April. Additional trains have also been introduced between Edinburgh and North Berwick and Gullane, two well-patronised seaside resorts in Haddingtonshire. On the Midland route, as from May 1, new trains were put on and alterations made in some of the existing times, with a view to expediting the services between Edinburgh and St. Pancras. For example, the 9.15 a.m. from Edinburgh (Waverley) leaves at 9.45, and arrives in St. Pancras at its old time, viz., 7.10 p.m., while the 2.25 a.m. from St. Pancras has been altered to leave at 4.25 and arrive Edinburgh 3.54 p.m., 14 min. earlier than previously, and connects now with the 4.0 p.m. Edinburgh to Glasgow. The 9.0 a.m. train from St. Pancras has also been accelerated so as to arrive in Edinburgh at 6.35, thus giving connection to Glasgow, as well as to Montrose and Aberdeen, which it could not make when it arrived in Edinburgh at 7.11 p.m. The new trains on this route are the 10.35 a.m. from Edinburgh (Waverley), due to reach St. Pancras at 7.55, with which connections are given from Inverness, Perth, Aberdeen, Montrose, Dundee and Glasgow. In the other direction the additional train is the 11.50 a.m. from St. Pancras, due Edinburgh 9.2, which forms a connection with the 9.15 p.m. train from Edinburgh to Glasgow. On the Aberdeen route the 3.40 p.m. from Aberdeen to Edinburgh has been accelerated, while a new sleeping car express to London (King's Cross) leaves Montrose at 7.0 p.m.

Commencing on July 10, a through carriage for Oxford will be attached to the 10.0 a.m. express from Edinburgh to King's Cross, while on the 8.40 a.m. from Glasgow a through carriage will be attached for Southampton, going forward from Edinburgh by the 10.15 a.m. East Coast express. The 12.0 noon train from Glasgow will run through as a restaurant car express to York, and, in addition, will convey through carriage from Glasgow to Scarborough.

North Eastern Railway.

Commencing July 10, a new through connection will be made from Aberdeen at 3.40 p.m. with the present 7.25 train from Edinburgh to London (King's Cross). Through carriages from and to Glasgow are to be provided in connection with the Aberdeen-Penzance through service, while the Edinburgh-Southampton through service will also run to and from Glasgow. The usual additional Anglo-Scottish trains will be provided, from King's Cross at 11.20 a.m. (with a through carriage from Scarborough

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attached at York), and from Glasgow at 12.0 noon and Edinburgh at 1.15 p.m. for London (with through carriage for Scarborough). These are partially covered also in sections devoted to other railways.

The 8.3 p.m. restaurant car express from Newcastle to York will be re-timed to cover the 44 miles 10 chains from Darlington to York in 43 minutes start to stop, thus restoring, though with a different train, the famous pre-war booking which for so long headed the list of fastest trains in Great Britain. The through train from King's Cross which in the summer of 1921 left London at 6.5 p.m., will be restored, leaving at 5.35 p.m. for York, Middlesbrough, Stockton, West Hartlepool and Sunderland, giving earlier and more convenient arrivals than as previously scheduled. The 3.35 p.m. train from York to Newcastle will leave at 3.40 p.m., and run through to Berwick, Edinburgh and Glasgow. Restaurant car accommodation will be provided throughout the journey. An additional train will be provided from Newcastle at 4.8 p.m. and principal stations to Berwick, thence taking up the running of the present 6.7 p.m. North British train for Edinburgh.

The present train from Southampton, Oxford, Banbury and the Great Central line, due at York at 3.20 p.m., will run through to Scarborough, the return train leaving Scarborough at 1.55 p.m. The 10.30 a.m. from Scarborough to York will leave at 10.10 a.m. and will connect with the 11.45 a.m. through train from York to Swansea, via Great Central and Great Western lines. Trains will also be provided from Birmingham at 9.30 a.m. via Derby and the Midland Railway to York and Scarborough, returning from Scarborough at 2.45 p.m. The present London and North Western train from Liverpool, Manchester, Wakefield, &c., via Normanton, due at York at 12.22 p.m., will also run through to Scarborough, returning at 2.45 p.m. On Saturdays a connection for Scarborough will be provided from the train from Liverpool, &c., due at York at 10.14 p.m. The through carriages between Glasgow, Edinburgh and Scarborough have already been mentioned. Through carriages to Scarborough will also be attached to the 12.10 p.m. ex Newcastle. Additional connections will also be given between Great Central and Great Northern trains for Bridlington, the 9.10 a.m. from Bridlington giving a connection also to Southampton West (arriving 5.10 p.m.) and Bournemouth Central 6.7 p.m. Certain improvements and accelerations will also be made between Birmingham, Midland Railway, and Hull.

Additional through expresses will leave Bradford, Midland Railway, at 8.40 a.m. and 4.25 p.m., and Leeds at 9.10 a.m. and 4.58 p.m. for Scarborough. In the opposite direction trains will leave Scarborough at 8.15 a.m. and 5.55 p.m. The 4.25 p.m. from Bradford and 8.15 a.m. from Scarborough are the

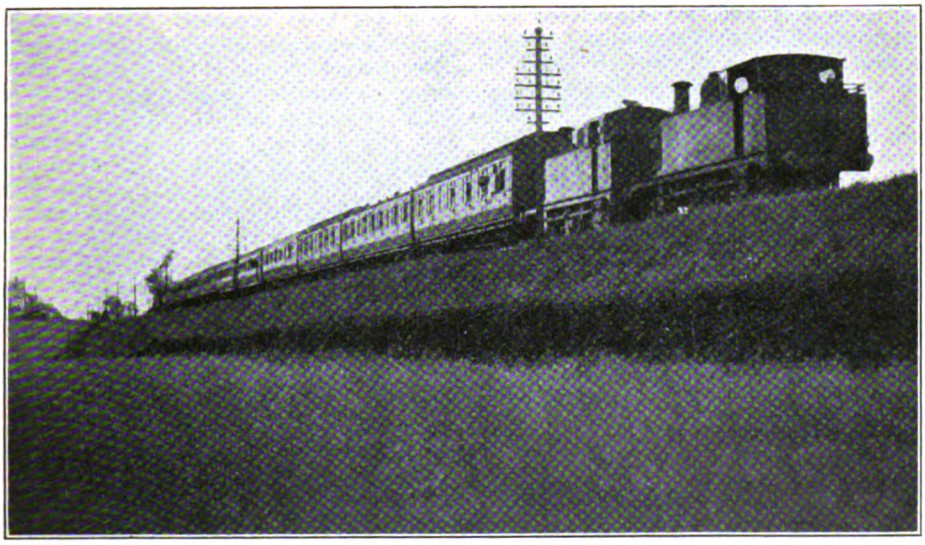

Photo.] MIDLAND RAILWAY. [*W. H. Whitworth.*

Train ascending Lickey incline, hauled by two superheater 4-4-0's and banked by two 0-6-0 tank engines.

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special non-stop expresses between Leeds and Scarborough so popular with residential travellers in pre-war days.

NORTH STAFFORDSHIRE RAILWAY.

In connection with the July train service (operating from July 10) the 11.0 a.m. Derby (N.S.) to Chester will be extended to Llandudno for the summer months, and a new train will leave Llandudno at 1.25 p.m. for the Potteries and Derby (Saturdays excepted), due Derby 5.45 p.m., also from Llandudno at 1.50 p.m. (Saturdays only), due to arrive Derby at 6.42 p.m. Through coaches will be run from Burton (Station Street) at 10.53 a.m. in connection with this service, with similar vehicles by the return service. Through coaches will also be run from Holyhead to the Potteries and Derby, leaving the former station at 7.30 a.m. daily, also on the 4 p.m. from Holyhead to Stoke, and on Saturdays to Derby (N.S.). A through service is also given to Liverpool, leaving Stoke at 8.25 a.m. A popular pre-war train has been reinstated on Saturdays between Macclesfield (Central) and Buxton, leaving the former station at 2.8 p.m., returning from Buxton at 9 p.m.

SOUTH EASTERN AND CHATHAM RAILWAY.

The outstanding feature of the new facilities which operate from June 11 are the new through services between Liverpool, Manchester, Birkenhead, Birmingham, &c., and the Kent Coast; the new coastal services connecting with the London, Brighton and South Coast and London and South Western Railways, and the acceleration of express trains to run between London and Folkestone in 80 min. and London and Margate in 90 min. A new service was introduced between the London and North Western Railway (Liverpool, Manchester, &c.) and the Kent Coast, on weekdays, as from June 12. The South to North train leaves Ramsgate Harbour at 11.0 a.m., calling at Broadstairs, Margate West, Westgate, Birchington, Herne Bay and Whitstable Town, running fast thence to Addison Road. The North to South train leaves Addison Road at 3.30 p.m. and runs direct to Whitstable, calling at the same stations as in the reverse direction. A dining car is attached to this train. The through Great Western Railway service between Birkenhead and Dover, Folkestone, Margate, &c., with connections to Hastings, will be reinstated on July 10. A dining car will be attached. Through coaches between Bournemouth and Dover will also be provided via Guildford.

Commencing June 11 numerous additions were made in the Kent Coast services, though these are substantially on the lines of last year, except that a new fast service is run, leaving Ramsgate Harbour at 9.40 a.m., and serving Margate, Herne Bay and Whitstable, running direct thence to Victoria. The Sunday "Pullman Limited" service between London and Margate, Broadstairs and Ramsgate has been resumed. The down train leaves Victoria at 10.0 a.m., returning from Ramsgate Harbour at 5.30 p.m. The run from Victoria to Margate occupies 90 min. The 4.0 p.m. and 7.0 p.m. down trains and the 11.0 a.m. and 5.0 p.m. up trains from Folkestone Central (Dover Priory 10.37 a.m. and 4.47 p.m.) are expedited, so that the run between Charing Cross and Folkestone Central occupies 80 min., instead of 85. Additional trains are provided on Saturdays between London and Hastings, leaving Charing Cross at 1.45 p.m. and Hastings at 3.15 p.m. In regard to the suburban district the down evening business service via London Bridge has been remodelled on the lines of the morning service, which has proved so successful since its introduction in February last. This has resulted in several extra trains being put on, which should considerably relieve the overcrowding during the evening pressure.

In addition to the railways covered in detail, several others indicate that their summer train services will be substantially on the lines of last year. In the case of the Great North of Scotland an extensive programme of day and half-day excursion trains has been arranged, including the well-known Wednesday and Saturday afternoon excursion trains from Aberdeen to Dee-side and other places on the system.

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Railway Art and Literature in 1922.

WHEN the RAILWAY MAGAZINE made its first appearance on the bookstalls in 1897, British and Irish railways did not number among their excellences a true appreciation of the aid that art and literature contributes in expanding the volume of holiday travel with consequent benefit to railway receipts. So long as the patient public were plentifully provided with time-table information, surely that was sufficient! The picture poster and the artistically illustrated booklet were not unknown, but the output was diminutive compared with the avalanche of literature and the plentitude of posters that heralded each summer season in the early days and during the adolescence of the twentieth century. Then came the war and a gradual stoppage of all enticement, much more inducement, to travel, until in fact the fares were raised for the avowed purpose of compelling the would-be traveller to stay at home and thus avoid congesting the lines needed for military traffic. Fares thus raised were afterwards maintained and further increased to meet growing railway expenditure, but since then—and particularly pronounced it is in this year of grace 1922—there has been a tendency to give the holiday maker such advantages, he will seek recreation by travel, and that in comfort by railway, rather than by racing the roads in motor coaches where he will, as the poet puts it, "breathe clouds of dust and call it country air." As a result we are witnessing some return to the pre-war standard of railway art and literature and not a few RAILWAY MAGAZINE readers are watching the developments with keen interest.

CALEDONIAN RAILWAY NEW GOLFING POSTER.
(Actual size 60 in. by 40 in.)

CALEDONIAN.

It is as easy to write with enthusiasm as it is difficult to express in terms that could justly be called exaggerated, the appreciation one feels of the pictorial excellence of the posters now exhibited by the Caledonian Railway. True, the scenic grandeur of Bonnie Scotland lends itself with equal facility to portrayal by the artist's brush as it does to the descriptive powers of the poet's pen. Gleneagles,

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of course, holds pride of place among the subjects chosen by the Caledonian authorities for the mural decoration of railway stations and other points of vantage. The proud boast " There is no better golf course in Great Britain than Gleneagles " in white letters on a green ground, with a lady golfer in a red jersey watching the flight of her ball makes an exceedingly effective poster, while other " Gleneagles " pictures, entitled " The ' Howe o' Hope,' " " The ' Lover's Gait,' " " The Witches' Bowster," are equally meritorious. Another magnificent combination of the poster painters' art and of the colour printers' skill is a picture portraying that lovely lake—Loch Tay overshadowed by the bold summit of Craig Chailliach and the cairn-crowned Ben Lawers, the monarch of the scene. This picture should be particularly potent in luring the tired-eyed city man from the dusty recesses of his business environment for a healthy holiday in the Highlands of the north. One other notable Caledonian publicity product illustrates in effective colouring, Moffat the holiday resort of the Scottish lowlands, and yet another, Loch Awe hotel, which is reached by the Callander and Oban line.

In the production of holiday books the Caledonian Railway has, for a long course of years, been well to the fore, and this season is no exception to the rule. There are new editions of all the popular publications that have earned so much approbation in the past. These include an illustrated guide containing particulars of hotels, boarding-houses and furnished apartments and also an angler's guide. Very useful to intending visitors to Scotland are the booklets issued in conjunction with the Glasgow and South Western and North British Railways providing particulars of the steamboat services to and from the Clyde coast.

FURNESS.

No fewer than eleven golf courses in the Lake District are served by the Furness Railway and these form the subject of a new poster. Printed in blue, black and green on a white ground and including a map of the railway with the golf courses distinctly marked, it answers its purpose admirably. For the holiday maker and tourist a revised edition of the company's illustrated guide has been published, together with various leaflets and a folder concerning circular and other tours through Lakeland.

GLASGOW AND SOUTH WESTERN.

It was the poet Thompson who inquired
Who can paint like nature ?
Can imagination boast amid its gay creation,
Hues like hers ?

The pictorial posters of the Glasgow and South Western Railway for the current year are doing their best to supply the answer, and *inter alia* induce the Southron to say with Shakespeare, " I will resolve for Scotland." A cynic has said that the best scenery in the world is improved by the presence of a good hotel in the foreground. Perhaps the Glasgow and South Western " Turnberry " poster will convince him that the sea in the foreground, a good golf course in the centre and a thoroughly modern and convenient hotel slightly to the rear, have in them the making of a perfect holiday haunt. Attractive to many who find a pleasure in going down to the sea in ships—but not too far—is the big colour picture showing the paddle-steamer " Glen Sannox," making a trip to the Clyde watering places. In these days—or nights—of the ubiquitous whist-drive there is a topical touch in the "All Trump" poster proclaiming that eliminating chance by selecting an Ayrshire coast resort as a holiday centre is " Not a gamble " Topical too, is the " clock-face " poster recalling the co-incidence of holiday time with " summer time " and naming a dozen centres on the Glasgow and South Western system where the seeker after rest and recreation may find health-giving ozone, golfing, bathing and boating.

In addition to a new edition of the company's well-known pocket guide to the golfing resorts it serves, the Glasgow and South Western Railway is gratuitously circulating an excellent 32-page booklet illustrated by colour pictures and a map and entitled, " Scotland's Playground." It describes the south-west of Scotland, the country of Caledonia's national poet, Burns, where focussed and epitomized the traveller from afar will find Scottish history, Scottish scenery, Scottish comedy and tragedy, all of which combined to inspire " Robbie " so that he wrote :—

O Scotia ! my dear, my native soil !
For whom my warmest wish to Heaven is sent !

GREAT CENTRAL.

For the summer of 1922, a new edition of this company's guide to holiday resorts, hotels, boarding houses and apartments contains a useful map of the Great Central Railway and its connections. As in former years, the book is profusely illustrated. Particulars of South of England resorts are included for the guidance of the large number of holiday makers resident in northern and midland counties who desire to travel by the Great Central line to London, where they may either break their journey, or at once cross to another railway's terminus *en route* to a southern seaside resort. Cleethorpes is the maritime holiday attraction of the Great Central itself, and in conjunction with the Cleethorpes' Council a new and attractive poster, printed in colours is being exhibited.

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It is entitled "A Gigantic Wave of Happiness"—aptly named it depicts juvenile joy *par excellence*.

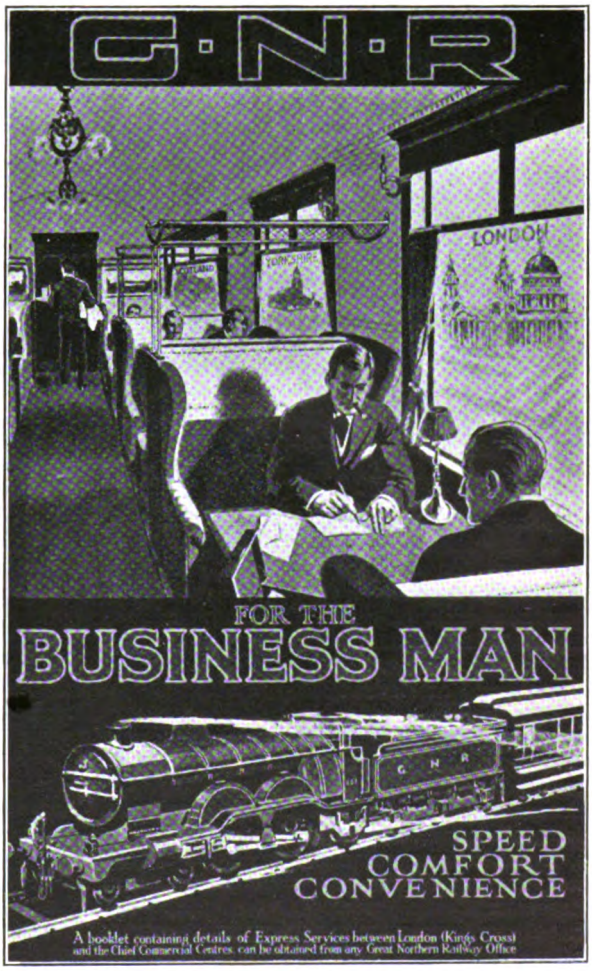
GREAT EASTERN.

This railway was one of the first British lines to realise the power of the printing press in promoting passenger traffic, and to-day, so far from being a lost art at Liverpool Street, the well-tried policy of publicity is vigorously pursued. The new posters for 1922 are letterpress in well-matched colours, and in addition to those advertising happy, healthy holidays at East Coast resorts, prospective holiday-makers are reminded by others of the inexpensiveness of Belgium and the advantages of the Harwich-Antwerp route. Another announces week-end tickets to Zeebrugge via Harwich, June to September, and gives details of fares, availability of tickets, trains, &c., and last, but not least, mentions the fact that these holders of week-end tickets require no passports, provided they are British subjects, or Belgian subjects, or French citizens resident in the United Kingdom.

In the way of guide books the Great Eastern has a prime assortment. "Evenings by the Sea," a 24-page pamphlet, contains eleven choicely coloured pictures portraying the after dark delights of Yarmouth, Lowestoft and other east coast holiday haunts. "Seaside and Countryside by the Great Eastern Railway" (price 6d.), edited by Percy Lindley, is replete with pictures in colour and in halftone. A pamphlet by the same author, entitled "An Ideal Holiday," describes and illustrates the district of the Broads and eloquently appeals to lovers of things aquatic. For intending travellers to the Continent several profusely illustrated booklets are provided, while for the American visitor to England, "Cambridge University"—a guide to the Colleges, issued by the Great Eastern Railway—may be strongly recommended, and to other visitors too, if unacquainted with the architectural glories and romantic history of the ancient University town, the Camboritum of Roman days and Cantebrigge of Chaucer's pilgrim. Then again, there has just been published the first of a series of four booklets descriptive of the historic and literary features of East Anglia. These books are being written by Mr. F. V. Morley, a Rhodes Scholar now at Oxford University, and are personal impressions of a series of pleasant journeys through East Anglia. Entitled "The English Orient," the books are sold at One Shilling each, and may be obtained at 71, Regent Street, W.1, at the Enquiry Office, Liverpool Street, or by post from the Publicity Office, General Manager's Department, Liverpool Street Station, E.C.2.

GREAT NORTHERN.

Posters produced at King's Cross are always noteworthy. RAILWAY MAGAZINE readers require no reminder of the bracing Skegness picture that achieved astonishing fame. This year's output is worth more than passing notice and it may be safely said the pictures will attract considerable attention wherever exhibited. It is not to the holiday maker alone that the Great Northern makes its appeal. Speed, combined with


G·N·R
LONDON
FOR THE
BUSINESS MAN
SPEED
COMFORT
CONVENIENCE
A booklet containing details of Express Services between London (Kings Cross) and the Chief Commercial Centres can be obtained from any Great Northern Railway Office

GREAT NORTHERN RAILWAY.
Facsimile of the "Business-Man's" Poster.

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comfort and convenience, is a business proposition and one of the most striking posters intimates the advantages of travel by the Great Northern line for men engaged in commercial pursuits. Others tell of the bracing character of the east coast—Southend, Sutton-on-Sea and Mablethorpe are each the subject of animated pictures—Southend " for bounding spirits " will appeal to all who have an eye for life and movement, as well as gay colouring.

The Great Northern Railway tourist programme from June 1 to October 31, contains a wealth of information concerning fares, break of journey, reserved seats, ticket offices, and so forth, but to help the prospective holiday maker to make his decision a capital selection of holiday literature is provided, together with the inevitable down-to-date and carefully corrected edition of the 1922 hotel and apartments guide.

GREAT NORTH OF SCOTLAND.

For those who desire a dry bracing climate the Aberdeenshire and Banffshire Highlands in summer may be recommended, and for the service of travellers from afar a useful book giving particulars of furnished lodgings in the districts served by the Great North of Scotland Railway is published year by year. The edition for 1922 includes a map in colours, showing railway lines, coach and steamer routes and the roads traversed by the almost ubiquitous motor omnibus. The premier holiday attraction of this railway is its " Three Rivers Tours " by rail, motor and coach via the Dee, Don and Spey. Full facts may be gleaned from the book which is issued gratuitously from the General Manager's office at Aberdeen.

GREAT WESTERN.

Serving as it does, that painter's paradise, the Cornish Coast, it is quite in accordance with the fitness of things that the Great Western's latest contribution to holiday art should be a realistic poster portraying a gorgeous marine sunset. The picture is called " The Golden West " and the artist is Arthur Sowyer. Critics unacquainted with the charms of Cornwall, or the delights of Devon, may vainly imagine the glowing hues of the picture to be far-flung artistic fancy, or at least exaggerated in the warmth of its tones, but those who know and love the natural wiles of the west will admit its general faithfulness. Another artistic production, is a double-crown poster illustrating in exquisite colouring St. Ives Bay, Cornwall and the Tregenna Castle Hotel, St. Ives. This fine hotel is railway owned and stands in grounds of one hundred acres. It commands magnificent marine views and is within a few minutes' walk, through the gardens, of the railway station.

For holiday booklets, the Great Western has a long established name and fame. A novelty this year is a dozen four-paged booklets, each telling a different story under the general heading of " The Line to Legend Land." Those who find pleasure in the pranks of " piskies " and stories of giants, pious mediæval monks, mermaids and other small deer of bygone days will delight in these. Each one is illustrated on the front page by a quaint and appropriate picture, while the fourth page bears a map showing the Great Western lines and connections.

HIGHLAND.

Among the posters this year decorating the notice boards there is a particularly distinctive one that advertises " The Highlands of Scotland " and the various hotels owned and managed by the Highland Railway. It illustrates in fine and profuse colouring the glories of the highlands, while prominently in the foreground a young lady in a red jersey is holding a deer-hound by a leash. Another quite new Strathpeffer Spa poster used this year by the Highland Railway is an admirable example of colour printing. RAILWAY MAGAZINE readers should look out for it. Strathpeffer Spa is a great asset to Scotland. It obviates the need for travel to some foreign spa for hydrotherapeutic treatment, and for the information of health seekers and holiday-makers the Traffic Manager of the Highland Railway, Inverness, is distributing a well-illustrated booklet. From Inverness, likewise, comes a new edition of the " Official A.B.C. Tourist Guide to the Highlands of Scotland via the Highland Railway." This latter guide gives evidence of the realisation of the interest there is to the general public in railway features as well as in scenery, for the illustrations include a full-page photographic view of the Highland Railway 4-6-0 locomotive, *Clan Campbell*.

LONDON AND NORTH WESTERN.

Second to none was the pre-war reputation of the London and North Western Railway in regard to its holiday literature which had, for its leading characteristics, both quality and quantity. Vast numbers of booklets were distributed, not in the British Isles only, but on the Continent and in the United States of America, while the hoardings and the railway station notice boards of the homeland were resplendent with the pictorial posters published at Euston. This great reputation is one that requires an effort to maintain, but it is being done in spite of all the disadvantages of the post-war period. This year the publicity department in addition to issuing the usual guides to the various holiday districts served by the London and North Western system, such as " Washington and

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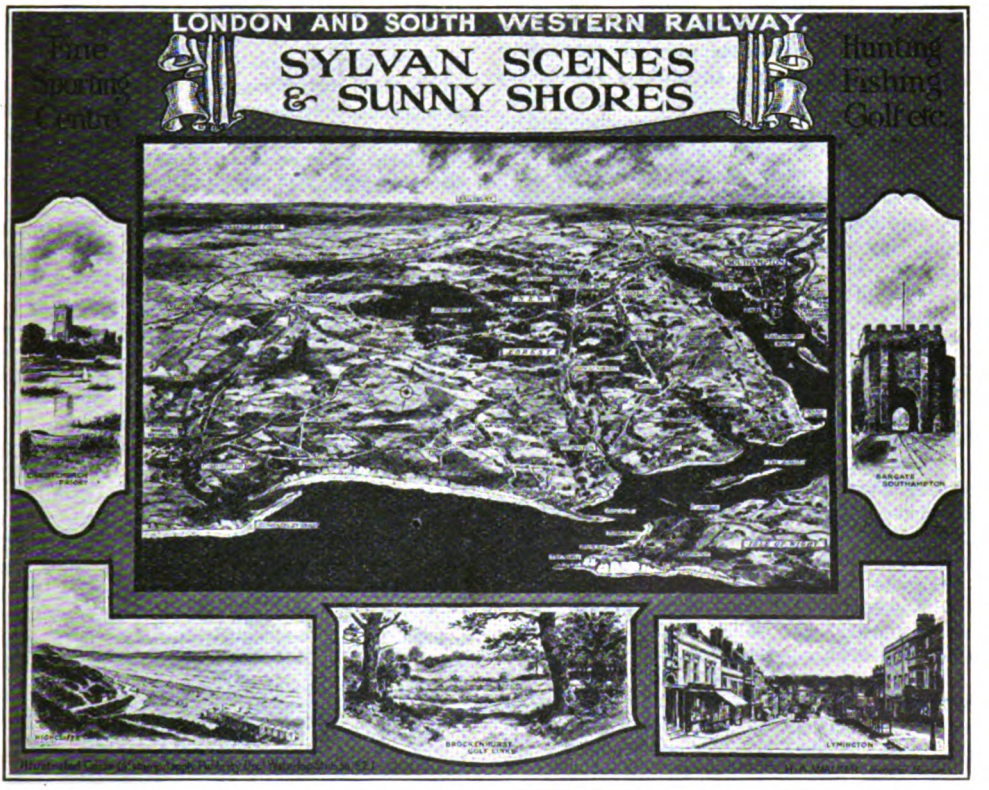
Franklyn's Country" and the "Spas of Central Wales" has produced for circulation, principally in the North and the Midlands, a charming guide entitled "Southern England —the Land of Flowers and Sunshine," written by Basil M. Bazley, the author of that pleasing guide first issued last year, "The Charm of England," specially intended for distribution in America. Mr. Bazley is an admirable cicerone—always entertaining, never wearisome, apt in quotation, and a friendly philosopher from whom the reader appeared. It depicts Conway Castle in the background, while the front portion of the picture shows a smart yacht riding at anchor, what time on her deck a leisurely yachtsman smokes the pipe of peace and contentment. A scene refreshing, indeed, these hot afternoons.

LONDON AND SOUTH WESTERN.

For health and pleasure this line serves some of the finest districts in England, and the publicity department at Waterloo makes



LONDON AND SOUTH WESTERN RAILWAY.
One of the new "District" posters that are attracting so much attention this summer.

parts with regret. The country described in Mr. Bazley's pages is not, of course, "North-Western" territory, but comprises the four seaboard counties of Kent, Sussex, Hampshire and Dorset together with the inland county of Surrey and some corners of Devon, Somerset and Wiltshire. To reach the places described by Mr. Bazley's facile pen, the denizen of industrial England usually has at his service the London and North Western route with its splendid permanent-way and magnificent rolling-stock.

Recently a new North Wales poster has good use of the splendid material at its disposal in the 1922 edition of "Hints for Holidays." An admirable guide is this to the south and west of England and the Channel Islands. It contains lists of hotels, boarding houses and apartments, and likewise caters for the commercial man by including particulars of business houses. Altogether the book contains much that is attractive and well worthy of close perusal. The illustrations are fine and include no fewer than sixteen colour pictures. The numerous maps are clear and reliable. It is an ideal

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guide and reflects great credit upon those responsible for its production.

In March last a dainty booklet was issued entitled "Early Holiday Delights in the South West." Quite up to the usual Waterloo standard of excellence, this well-illustrated brochure of 32 pages is calculated to set the townsman's heart yearning for the sylvan scenes and sunny shores it so exquisitely epitomizes.

Quiet holidays in Normandy and Brittany appeal to many, and the company has published a new edition of its guide to those two fascinating provinces of France. The book is full of useful information for every type of tourist, in spite of its modest disclaimer that it is not intended to replace Baedeker. All the same, ecclesiologists, golfers, seabathers, cyclists, students of language and of history, also those ordinary persons who form the principal portion of the population, will find in it just the helpful holiday hints that they require.

One cannot over-praise the 1922 poster output of the London and South Western Publicity Department. It is a superb collection. Several beautifully printed in colours are called "district posters." The object of the district poster is two-fold, first to attract visitors to the district, and then to encourage such travellers from afar, to take short railway trips when they are there, a copy of the poster being exhibited at each railway station in the district, as well as elsewhere, so that holiday makers may see how easily other resorts may be reached by railway. The district posters illustrate North Devon, East Devon, Dorset, North Cornwall, New Forest, and the Channel Islands. They are designed on the "Old Style Map" principle. This system has been adopted for book illustration, but not hitherto, so far as we can remember, has it been employed in poster production. Pride of place, however, must be given the Chertsey poster. This is a remarkably fine specimen of the latest rotogravure work. It is the first of this character to be printed by Messrs. Waterlow and Sons, Limited, but we understand others, in similar style, are to follow. Posters of Guildford, Exeter, Godalming, Jersey, &c., have been produced in conjunction with the various local advertising committees, and the company have also published a number of letterpress posters in connection with the Continental and excursion arrangements. In combination with other railways, the London and South Western Railway, has been advertising on the street hoardings the advantages of early holidays.

Just another poster calls for special mention. Its official title "The Holiday Problem Solved" conveys no suggestion of the artist's subject, a seashore scene in which animated nature claims first attention in the form of a cheerful, chubby, and altogether lovable specimen of human babyhood—naked and unashamed—who with an equally cheerful canine companion, is watching the very unmilitary march of a mammoth crab from the shingle to the sad sea waves. The title of the picture is taken from the fact that across the bottom is the inscription :—To solve the holiday problem, get a copy of—"Hints for Holidays" at London and South Western Railway stations and offices, or send three penny stamps to Publicity Department, Waterloo Station, S.E: 1.

LONDON, BRIGHTON AND SOUTH COAST.

Publicity on the "Brighton" is always conducted on high-grade lines. Good taste in art and literature are its prevailing characteristics and at the same time it never lacks freshness or variety. To attract visitors to the sunshine and sea breezes of the sunny south, well-chosen posters adorn the hoardings of the industrial north and midlands, and other suitable spots. But in merely magnetising the traveller from afar the department does not deem its duty done; it still has to make easy the path of the pleasure-seeking pilgrim. In connection with the "Sunny South Special" a through train every weekday, consisting of corridor carriages and a tea car to (and from) Birmingham, Manchester, Liverpool, &c., and Brighton and Eastbourne, &c., *via* Willesden, Kensington and East Croydon, a useful pamphlet is issued describing the resorts served and including a map of the route. For those who desire accommodation there is a well illustrated book containing an official list of hotels and apartments. Then there is a 16-paged booklet for wanderers by field-path, wayside and woodland, over turf-clad downs and heathery commons, bearing the title of "The Surrey Hills"; and for invalids and jaded workers who require a rest in healthy surroundings, the company distributes an informing pamphlet entitled "Nature's Finest Tonic."

Of the nine "Brighton" posters the present writer has before him, the two of greatest distinction—all nine are good—are those proclaiming "The Sunny South" They are an admirable pair, and the one is the necessary complement of the other, for one of them illustrates no fewer than fourteen finely-frocked young ladies seated (in deck chairs) on the sands facing west, while the other depicts the same number of holiday-garbed gentlemen of more or less youthful appearance similarly occupied, but delightedly gazing east!

LONDON UNDERGROUND ELECTRIC.

One versed in phrenology would probably affirm that the head of the publicity depart-

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ment of the London Electric Underground lines and associated train and omnibus companies is blessed with an uncommonly big botanical bump. Anyway the floral posters issued from Electric House are as charming as they are numerous and that they are genuinely effective is beyond all question. Crocus time, daffodil time, bluebell time and chestnut time each in its order has its appropriate picture poster and they are eagerly looked for by thousands of Londoners who speculate upon what will be the next. But the Underground does not depend upon floral schemes alone to induce city and suburban people to seek fresh fields and pastures new. Quaintness has its uses and so has the historic building properly pictured. The Underground is catholic in its tastes and consequently appeals to an enormous public.

The booklets produced under the same auspices are equally creditable and are calculated to suit the mentality of all sorts and conditions of people both old and the young.

METROPOLITAN.

On this railway publicity work is in the hands of the Commercial Manager and is always well done. Its holiday books and its souvenirs are, without exception, the last words in artistic production. Lately some very fine posters have been issued, and one of them is reproduced on this page. The originals are printed by colour-type process in brown, sepia and green. The one illustrated is attracting much attention among the visitors to London. It advertises a day at the Zoological Gardens, and is a fine piece of work. The massive head of the King of Beasts shows up with remarkable detail in the original. The Metropolitan Railway serves some of the most suitable spots in or around London, for school treats, annual outings, pleasure parties and the like. This fact is made the subject of a particularly pleasing pictorial poster.

SPEND A DAY
AT THE ZOO
London's Zoological Garden—one of the finest in the world—will well repay a visit. It is instructive, entertaining, and amusing; gives maximum pleasure at minimum expense; provides a restful change from the turmoil of Town and may be readily reached from all parts of London by the "METRO."
BOOK TO ST. JOHNS WOOD RD.
OR GREAT PORTLAND STREET

METROPOLITAN RAILWAY.

A Zoological Poster.

MIDLAND.

We have been privileged to inspect the proofs of a new Midland Railway guide-book, "The Peak of Derbyshire," and in its preface we are reminded that it was that accepted judge of the beautiful in nature, Lord Byron who wrote:

"There are prospects in Derbyshire as noble as any in Greece or Switzerland."

Travellers whose only knowledge of the district is derived from the views obtained from the trains on the Midland line will readily accept Lord Byron's dictum, even had he not the support of many other famous writers such as Sir Walter Scott and John Ruskin. The book, which is well-illustrated and of convenient size for the pocket, begins with Derby, the centre of the English midlands, which, in addition to being famous as a pre-eminent railway town is one of the most ancient boroughs in the land and possesses many features of antiquarian interest. The most valuable relic of old Derby stands on one end of Derwent Bridge. It dates from the fourteenth century and is the "Chapel of Our Lady of ye brigg." The present porcelain works, wherein is made the famous Derby china, are within a few minutes' walk of the Midland Railway station. These facts and hundreds of others referring to the villages and towns of the "Peak District" may be gleaned from the well-written guide book under notice.

For those seeking country and seaside holidays, the Midland Railway has issued the 1922 edition of its official directory of apartments, hotels, boarding houses, &c. The book likewise provides a list, of what to many youthful holiday makers, are the black clouds that loom through the latter days of golden summer, viz:—schools. The northern counties of Ireland too, have their Midland Railway connection via Heysham and are included in the book, the compilers of which must have taken "thorough" as their motto, so well and so exhaustively have they performed their task.

NORTH EASTERN.

A very fine series of holiday-resort posters has been issued for 1922, and we are repro-

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ducing a striking example on this page. Arresting and notable are the designs of other posters depicting the scenic glories of such places as Bridlington, Scarborough, Whitby, Harrogate, Whitley Bay, Northumberland, &c.

NORTH STAFFORDSHIRE.

Although in the opinion of Dean Inge the Staffordshire characters in Mr. Arnold Bennett's novels are people not worth writing about, there are others who think differently. Impressions as to Staffordshire as a holiday haunt likewise may vary. Known principally to the public beyond its borders, by reason of its famous pottery, the county has other claims to distinction, and to make these better known, the North Staffordshire Railway has provided two particularly informing posters. One of these, centred by a useful map, sets out the attractions for tourists, excursionists, pleasure and picnic parties to the following places celebrated for scenery of rock, water, wood and dale :—Ashbourne, Dovedale, Trentham, Sandon, Weston (Ingestre), Great Haywood and Colwich for Cannock Chase and Thugborough. Other points mentioned are Alton, Rudyard Lake, Rushton for Dane Valley, Biddulph, Keele, Norton-in-Hales, Mow Crop and the Manifold Valley. This long list is augmented by the information that Stoke-on-Trent and the federated pottery towns are situated upon this line of railway and are distinguished for their productions in china, earthenware and tesselated tiles for walls and pavements. In addition to views of scenery and churches, this poster includes the reproduction of a photographic print showing a train on the Manifold (Toy) Railway near Waterhouses station. The other North Staffordshire Railway poster—attractively printed in green and sepia—advertises the attractions of Rudyard Lake. This is a fine stretch of water of about 200 acres. The lake provides fishing and boating, and there is golfing amid charming scenery close at hand, the golf course in fact being at the north end of the lake, close to Rudyard Lake station.

TRAVEL BY THE EAST COAST ROUTE
GREAT NORTHERN RAILW
UNDERGRO
THE STRAIGHT ROAD TO SCOTLAND
For full Information apply Supt. of Line G.N. Rly. Kings Cross or Passenger Manager N.E.R. York.

A STRIKING POSTER RECENTLY ISSUED BY THE NORTH EASTERN RAILWAY.

SOUTH EASTERN AND CHATHAM.

This railway has a fine selection of holiday literature and an excellent poster display. In our August issue we shall deal fully with the uncommon characteristics of both.

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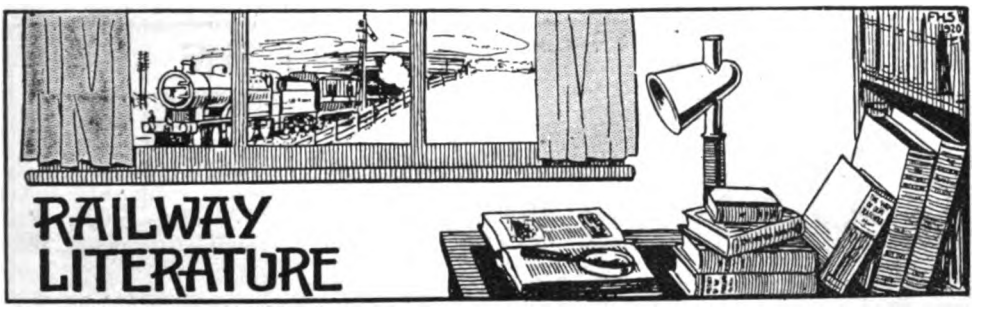

MODEL STEAM LOCOMOTIVES. By Henry Greenly. [Cassell & Co., Ltd. Price 6s. net.]

As an authority on the design and construction of model steam locomotives, Mr. Greenly is an acknowledged authority, and this volume will be welcomed by all model makers, and by many whose interest is more theoretical than practical. Utilising material published in *Work* and the *Model Engineer*, this volume includes a large amount of new matter, and within its 312 pages much useful information is contained. Illustrations make 376, line drawings and halftone. In the first chapter the author discusses choice of scale and gauge, and in the second locomotive types in detail. In the third chapter the main principles of model locomotive design are set forth, and subsequent chapters deal specifically with the chief sections—boilers, furnaces, axleboxes, wheels and axles, bogies, cylinders, valve gear, etc., leading up to the boiler mountings, general fitments, and firing and boiler-feeding devices. The practical note is maintained throughout, and a number of actual designs are included, so that with this book as guide, the model locomotive maker is well informed as to what is required to be done, and the best way to do it.

HANDBOOK ON RAILWAYS; BEING THE RAILWAYS ACT, 1921, WITH FULL NOTES AND AN INTRODUCTION AND INDEX. [By W. H. Aggs, M.A., LL.M., *Barrister-at-Law of the Inner Temple*; and G. W. Knowles, M.A., *Barrister-at-Law of the Middle Temple*. London: Sweet and Maxwell, Limited, 3, Chancery Lane, W.C. 2. Price 5s. net.]

This is a useful and handy production for all who have cause for cultivatng a close acquaintance with the Railways Act, 1921. Carefully indexed and well-equipped with notes it makes an admirable desk companion or addition to the railway bookshelf. True the arguments set forth in the introduction can claim no novelty, being mainly those with which the public who study railway affairs are familiar, but this circumstance does not detract from the value of the book as a convenient work of reference and a ready-to-hand source of information of all that is included in or comprehended by the Railways Act, 1921.

PERMANENT WAY INSTITUTION. (Journal and Report of Proceedings. Price to non-members, 2s. 6d.)

The April, 1922, volume of the *Proceedings* of the Institution includes, as frontispiece, a portrait of Mr. John Miller, Chief Civil Engineer, Great Eastern Railway, and President, 1920–21, and covers, in addition to reports of meetings, etc., papers on "The Burma Railways," by Mr. A. C. Hicks; the "Permanent Way Institution as an Educational Force," by Mr. W. Cleaver, Past President; "Improvements of Railway Curvature by Instruments," by Mr. H. W. Chester; "Railway Curves and Expansion," by Mr. T. Ridley; the "Ryde Pier and Isle of Wight Railway, 1878–1921," by Messrs. E. Benedict and E. Treacher; and the "Use of Wire in Relaying," by Mr. H. Minniss. A great deal of information of a valuable and practical nature is included.

EMPIRE FORESTRY. [Macmillan & Co., Ltd., St. Martin's Street, London. Price 4s. net.]

The first issue of a new quarterly under this title is to hand from the Empire Forestry Association, Imperial Institute, South Kensington. It is well produced, and includes many authoritative articles. In view of the importance of forestry, even more in the Dominions of the Empire than at home, this publication will be welcomed by all interested in forestry and kindred subjects.

THE Westinghouse Brake and Saxby Signal Company, Limited, send a pamphlet describing "The Re-Signalling of the Liverpool Overhead Railway with Daylight Colour Light Signals." This is a reprint from our contemporary, *The Engineer*, and sets forth the main features of this notable installation, both general and technical. The firm mentioned also send a pamphlet describing the "Electro-Pneumatic Decking Plant at the Thurcroft Main Colliery, Rotherham," reprinted from *Engineering*. Copies of both these publications can be had on application by responsible readers.

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RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions and weights of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. No reader should send more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, the pages of the "Railway Year Book" should be consulted. The twenty-fifth Annual Edition of this standard railway reference work is on sale at 5s. net, or by post, from the* RAILWAY MAGAZINE *Offices, 33, Tothill Street, Westminster, London, S.W.1, to any part of the world, 5s. 9d.*

Intermediate electrically-controlled signals between South Liberty Junction and Flax Bourton Station, Great Western Railway.

The object of the intermediate electrically controlled signals is to divide a long block section without incurring the expense of provision and maintenance (including signalmen's wages) of an intermediate signal box. The distance between the places named which can be referred to as A and B, and the position of the intermediate signals are correctly given. A distant signal exists for each line, approximately 1,000 yards from the intermediate home signal. When the signalman at A receives "Line clear" from B for the passage of a down train he lowers his signals, including the advanced section signals, which are operated by a special lever, for the train to proceed, and when it has passed a point a quarter of a mile in advance of the intermediate home signal an audible indication is given at A when the signalman then sends "Train entering section" signal to B. (The intermediate signals automatically revert to the danger position immediately a train passes, and so remains until again lowered by the signalman at A operating the special lever.) The signalman at A can then allow a following train to proceed to the advanced section signals in exactly the same way as he would pass a train forward to an ordinary advanced starting signal to wait "Line clear." When the first train has passed B the "Train out of section" signal is sent to A and the signalman at the latter place then sends the "Is line clear" signal, and if accepted lowers the advanced section signals and sends the "Train entering sections" signal as set out above. The intermediate signals do not automatically fall to the "all right" position when the train clears Box B as stated. The line between A and B is track circuited throughout with a break at a point 440 yards in advance of the intermediate home signal, and an indicator is provided at Box A showing whether the line is occupied or not between that box and the point referred to; it will be gathered that by adaptation of the track-circuiting method, block signalling is carried out in almost precisely the same manner as would be done if an intermediate block post were provided. The section of line in question is a busy one, and as the Great Western Railway has deemed it desirable to provide such signals it can safely be assumed that the expense is justified.

[Reply to "SILURIAN."].

Tube Railway Schedules.

London Electric Railway.—Hammersmith to Finsbury Park, 8 miles, 71 chains; 30–32 minutes; 19 intermediate stations. Charing Cross to Highgate, 4 miles 34 chains; 17–18 minutes; 11 intermediate stations. Charing Cross to Golders Green, 6 miles 26 chains; 21–23 minutes; 11 intermediate stations. Elephant and Castle, to Queen's Park, 6 miles 61 chains;

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24½–25 minutes. *Central London Railway.*—Liverpool Street to Wood Lane, 6 miles, 62 chains; 22–24 minutes; 13 intermediate stations. *City and South London Railway.*—Clapham Common to Euston, 7 miles 22 chains; 31½–33½ minutes; 13 intermediate stations. *Great Northern and City (Metropolitan) Railway.*—3 miles 41 chains; 12 minutes; 4 intermediate stations.

[Reply to F. Y. and N.]

London and North Western Railway Locomotives.

We have no particulars of the tests you mention in which one of Mr G. Hughes' new 4-6-0 four-cylinder locomotives and an electric motor coach were utilised, but trials of this character are carried out now and then on most railways, and it may be that Mr. Hughes will, in due course, contribute a paper to one of the engineering institutions in which the results of these trials will be given. With regard to a suggested 2-6-2 tender locomotive on this line, we understand that, while such a design has been contemplated, there is no immediate prospect of its realisation, if at all.

[Reply to J. DEARDEN.]

Queer Railway Ideas.

The suggestion you mention is by no means new, though the idea that, in order to enable passengers to be set down and picked up without stopping, a small electric train should be run alongside an express so that passengers can change from one to the other, imports an element of novelty. We agree that exactly corresponding speed would not easily be attained, while if there were much transfer of passengers and baggage the local train would require a considerable length of parallel line. Many thanks for your congratulations concerning the 300th number of the RAILWAY MAGAZINE.

[Reply to R. N. MICKLEWOOD.]

London and South Western Railway Locomotives at Redhill.

We are informed by the Publicity Department of the London and South Western Railway that the 3.34 p.m. from Waterloo (4.49 p.m. from Guildford) is run through to Redhill for the benefit of school-children. The vehicles are worked through to Redhill by a London and South Western locomotive, and return the next morning drawn by a South Eastern and Chatham Railway engine. The London and South Western Railway engine takes a South Eastern and Chatham Railway train (originally from Charing Cross) from Redhill to Guildford in order to work back.

[Reply to "VOELAS."]

Standard Lengths of Rail.

Great Western Railway, 44 ft. 6 in. and 32 ft. (with a sprinkling of 60 ft.); Caledonian Railway, a few 60 ft., but chiefly 48 and 32 ft.; North British Railway, 48 ft. and 40 ft. mainly, but some lengths of 30 ft. and 24 ft. in the main lines. The English standard generally is 45 ft., replacing 30 ft.; the Midland and Great Central Railways have substantial lengths at 36 ft. and the London and North Western Railway is almost exclusively 60 ft. We have not by us the length of rail used on the Forth Bridge.

[Reply to CHARLES SCOTT.]

Recovering Time.

The point you discuss has been dealt with already by Mr. Cecil J. Allen in his monthly articles. It is a self-evident mathematical axiom that a disproportionately high downhill speed is necessary to recover time lost by the fall of speed up-hill below a certain given average; for example, to maintain an average overall speed of 60 m.p.h., an uphill average of 45 m.p.h. requires a subsequent downhill average of 90 m.p.h. to prevent loss of time.

[Reply to THOS. A. FAY.]

London and South Western Railway Locomotives.

We cannot say whether Mr. Urie considers the results obtained by superheating 0-6-0 tender and 0-4-4 tank engines sufficiently satisfactory to warrant other engines of those classes being similarly improved. It is, however, quite unlikely that any of the "Adams" 4-4-0 tender engines will thus be dealt with, as they are now chiefly used for miscellaneous duties on country lines.

[Reply to "HANTS."]

Steam Locomotives, Central London Railway.

There is one steam 0-6-0 condensing tank engine, used for depôt duties and on night working trains in the tunnels when required. *See* RAILWAY YEAR BOOK, 1922 Edition, for information of this

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character. It is against the rules of this section to give particulars of where locomotives are stationed, especially as this information would often be out of date by the time a reply was published.

[Reply to D. CAMPBELL.]

The London and North Western Railway and Broad Street.

The "City to City" express no longer runs, but tender engines of the London and North Western Railway are frequently seen at Broad Street on goods trains, of all classes up to, but not including, the "Claughtons." Certain of the morning business trains from Watford direction are also frequently worked by 0-6-0 tender engines.

[Reply to H. S. HACK.]

Isle of Wight Locomotives.

We are informed by Mr. H. K. Day, Secretary and General Manager of the Isle of Wight Railway, that the 0-6-0 engine *Bembridge*, built by Manning, Wardle & Co., was taken over by the Government during the war, and was, he believes, used on the Western front. He is not able to supply further information.

[Reply to "BONCHURCH."]

Great Western Railway 4-6-0 Express Engine "Kirkland."

We are obliged for your information that this engine was named after a horse owned by Mr. F. Bibby, a Great Western Railway director, which won the "Grand National" in the year the engine was built. We have no information as to the number and future sphere of operations of the Great Western Railway 4-6-0 engines now building.

[Reply to "GREAT BEAR."]

Villages many Miles from Railway Stations.

We cannot locate the village in Wiltshire which is 13½ miles from a railway station, as to which you ask, but should imagine there must be many places where even greater distances than this are concerned, particularly in the more sparsely-populated counties and in Scotland.

[Reply to C.E.B.]

Signalling Schools.

THE RAILWAY YEAR BOOK mentions cases where special attention has been given to training in signalling of railway officers of all traffic grades, but on every line there are signalling schools for training signalmen themselves. These are usually provided at principal centres in addition to headquarters.

[Reply to R. GILLAM.]

Axholme Joint Railway.

This railway is 27¾ miles in length, and became joint property on July 31, 1902. It is jointly owned by the North Eastern and London and North Western (late Lancashire and Yorkshire) Railways, and traffic of both companies is worked concurrently. It has no engines and rolling-stock of its own.

[Reply to N.Y.N.]

Special Trains.

Certain railways make a practice of affixing numbers in front of the engines and in the windows of guards' brakes of special trains, corresponding with the numbers of these trains in the weekly staff notices of special trains, so that each train may be recognised by signalmen and others concerned in the working.

[Reply to "BEAGLE."]

Third-Class Carriages.

There are good points about wooden seats, if well designed, for crowded suburban traffic, in that they can be kept much cleaner than padded seats. We understand that in the case of the railway you mention, however, new stock will include seating more in accordance with modern ideas.

[Reply to J. H. H.]

2,318,918 Locomotive Miles.

As your query is one of general interest with those who remember the famous London and North Western 2-4-0 locomotive No. 955, *Charles Dickens*, the total mileage made by this engine to October, 31, 1911, is recorded here, though you have yourself provided the answer.

[Reply to G. W. BISHOP.]

British Locomotives under Grouping.

No doubt each section will retain its present types of locomotives and rolling-stock, and the colours now in use, for some time. In due course, there will certainly be a degree of uniformity, if not actual standardisation, within each group, though the process may take a number of years before it becomes general.

[Reply to A. M. GUNN.]

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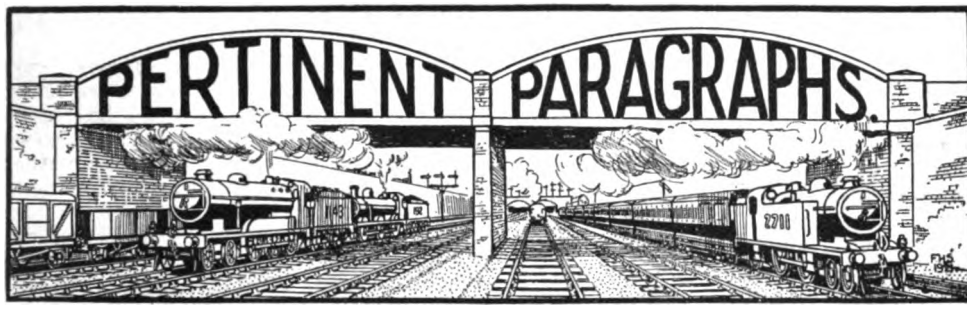

Our 300th Number.

WE have to thank our numerous correspondents for many kindly and appreciative congratulatory letters received since the publication of the June RAILWAY MAGAZINE, "No. 300." Also the many press notices received, all commenting favourably upon the RAILWAY MAGAZINE as a publication, emphasising the review character of the June number, and expressing favourable recognition of the standing and authority which it has attained during 25 years of continuous publication. It has, indeed, been a pleasure to read the numerous letters and press references which have come to hand, and to all concerned we tender our sincere thanks.

The Grouping of the Railways.

As far as the Western group is concerned, much of the preliminary work is already completed, most of the Welsh companies have been amalgamated with the Great Western, and are already operating as sections of the new "Western" system, and a number of district and divisional appointments have been made to meet the new conditions. Arrangements are also nearly completed in regard to the subsidiary companies to go into that group. In the case of other groups matters are not so far advanced. Combination of the enlarged London and North Western and the Midland Companies has been definitely announced, the amalgamation of the Hull and Barnsley and the North Eastern is an accomplished fact; the South Eastern and London, Chatham and Dover Companies are to be amalgamated, thus eliminating the Managing Committee; and other developments are imminent; but so far there is not much to report.

Many readers are much exercised as to details of grouping, and what is involved. It does not seem to be generally realised that actual amalgamation and the formation of a single company for each group is aimed at. This will involve one directorate, as specified by the Railways Act of 1921, one chief management (with divisional managements which will probably operate the present separate systems on a partially independent basis until the separate components gradually become so associated that the existing "frontier" and "separatist" elements gradually become less and less important), and a unification of rolling-stock, signalling and permanent-way practice and design, and of stores departments, office methods, etc. But for many years most, if not all, of the great railway works will operate substantially as at present; it will be a long time before the locomotives of each group can be standardised; it will be a slow process ere all the engines and rolling-stock are painted in the same colours and style, bear group number plates, etc., and, speaking generally, for a considerable time to come present conditions will not be greatly altered, though the influence of grouping will gradually become more and more strongly manifested.

Group Names and Colours.

MANY suggestions have been advanced for names for the groups. So far, none which have come under our notice appeal with any particular strength, and the matter must be left for the respective group directorates to announce the titles of their choice. Another question which appears to interest many of our readers is that of the colours of locomotives and rolling-stock. Naturally these will be eventually standard throughout a group, but present practice affords no guidance. Midland red, Caledonian blue, and Glasgow and South Western and Highland green may give place to North Western black, in the case of locomotives. On the other hand, the Midland scheme of painting, which has so much to recommend it artistically and otherwise, would make a fine livery for the whole group, especially if it were accompanied by the same style of livery for coaching stock, though we shall be sorry if the North Western and West Coast colours have to go. In the Eastern group green is the predominant colour for locomotives, as also in the case of the Western group. Should the same colour be adopted for the Southern group it would restore the locomotives of the South Eastern and Chatham Railway to some of their former artistic interest. But there is nothing to indicate what will happen in this connection, and we must adopt the historic phrase,

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"Wait and See," in this, as in regard to other changes which the new Railway Act will involve.

The British Four-wheeled Wagon.

IT is a stock gibe that British railways are unprogressive in their continued use of four-wheeled wagons as the standard type for goods and mineral traffic. Mr. W. Davison writes at length recalling attempts made by his father to obtain an introduction of the American type of freight car, but using special features of design introduced by the Tubular Frame Wagon Company, Limited. An example was exhibited and tested by arrangement with the Great Western Railway at Paddington, but apparently no results of importance followed. Mr. Davison is, however, still of the opinion that, whether according to his father's or other special design, or as a development of practice, the British railways are much behind-hand, in that there are still relatively few high-capacity bogie wagons used. Seeing how common is the impression that our general non-use of bogie wagons is regarded as evidence of backwardness on the part of railway officers, we may point out that while there is a limited field for such vehicles, particularly where full loads run regularly on definite routes, or where there is a steady stream of traffic, yet for general application railway officers are almost unanimous in their preference for the useful four-wheeled wagon.

It must be remembered that so many wagons are run to varying and miscellaneous destinations, and it is far easier to obtain a load for a single 12 or 15-ton wagon than for a vehicle of larger type. Indeed, for miscellaneous traffic, it is a simple matter to run two or three wagons to convey 30 or 40 tons, one or two only of which would be required for a lesser consignment, whereas were 30 or 40-ton vehicles the standard, a large proportion would be necessarily run more or less frequently under load, or else consignments would have to be held up until a sufficient total was available to justify running a vehicle. The whole matter is, indeed, explained by the essential difference between British and American conditions, and it can be taken as beyond question that were the high-capacity vehicle as generally favoured as is made out in some quarters it would have become quite common on British railways years ago.

The First Restaurant Car.

COMMENTING upon a reply recently given in "The Why and the Wherefore" section, Mr. H. H. Meik sends a cutting from *The Railway Times* of April 18, 1846, in which a proposed railway restaurant car is thus described, as quoted from the *Bristol Gazette* :—"The invention consists in the construction of some newly-formed carriages, so as to constitute a sort of travelling *caffe*, or railway restaurant, to be placed in the rear of the carriages, which are to be so constructed as to open into one another to any extent, enabling waiters to travel along the train, and relieve the *ennui* and hypochondriacism, so inseparable from railway travelling, by supplies from a locomotive larder at the other end. A bill of fare, showing what the refectory contains, is to be posted in each carriage; so that passengers, first, second and third, may at any time stay the rage of hunger. Bells are to be at the command of the passengers. to announce their wants to the waiter, who will travel to them along a narrow passage alongside the interior of the carriages constructed for the purpose. Should the proposed plan, which had its origin at Hull, be adopted, railway travelling may be ranked among the beatitudes."

We are not aware, however, that this proposal was realised until many years afterwards. As Mr. Meik points out, the earliest restaurant car train appears to have been the famous 2.0 p.m. betweeen Euston and Glasgow, which was given a restaurant car in 1892, though the train was not vestibuled and passengers therefore had to change vehicles if they did not travel in the car throughout. Meals and refreshments were, of course, served in Pullman cars of earlier date on various railways.

Extensions at Southampton Docks.

AT a recent meeting of the Parliamentary Committee of the Southampton Corporation, Major G. S. Szlumper, Docks and Marine Manager, London and South Western Railway, explained the proposals for important new works in further extension and development of the Southampton Docks, to be undertaken by his Company. The scheme supersedes that originally prepared and known as the Woolston scheme, and will involve a line of piers and one or more dry docks on the River Test extending from a point near the Royal Pier towards Millbrook, a distance approximately of 2 miles. The Committee, after examining the scheme in detail, unanimously passed a resolution welcoming the proposals of the London and South Western Railway Company, and appointed a sub-committee to confer with the company's representatives in reference thereto. The new works involve the reclamation from the River Test of 648 acres of mud land, and the construction of a line of new docks or piers extending for about two miles past Southampton West station and thence to Millbrook. The intervening space, covering a distance and in the seaward direction from the Western Esplanade to the

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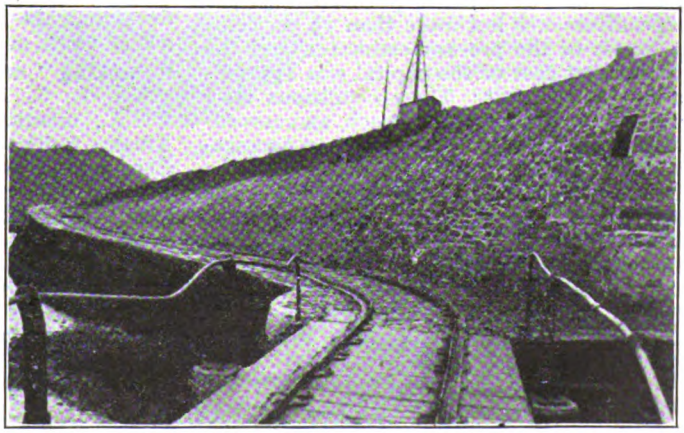
MR. F. V. MILTON, PUBLICITY DEPARTMENT, LONDON AND SOUTH WESTERN RAILWAY, INSPECTING THE OLD FLANGE RAILWAY AT BUDE.

pierheads of nearly three-quarters of a mile, will provide a large area of reclaimed land to a depth of about 2,000 ft. available for business and residential purposes, also for a public park adjacent to the Royal Pier with frontage to the river, and recreation grounds there and at Millbrook. A new 600-ft. channel, widening at the approaches to the piers to 1,400 ft., is to be dredged, and each pier will be capable of accommodating two of the largest liners afloat. An important feature of the scheme is that traffic will be able to approach via the Hurstbourne and Fullerton line, an alternative route from London and for traffic from the west and north. There is also an associated proposal for a new floating dock capable of accommodating the largest vessel afloat or likely to be built for some years, and this will probably be placed between Trafalgar Dock and the Town Quay.

A Flange Railway in North Cornwall.

IN the February, 1917, RAILWAY MAGAZINE and again in October, 1921, reference was made to a flange railway connecting the beach at Bude, North Cornwall, with the canal side and with a siding from the station goods yard. Two interesting photographs are now available, specially taken for us by the Publicity Department of the London and South Western Railway, and the following particulars may be recapitulated :—

The flange railway at Bude is a narrow-gauge sand track belonging to the Stratton and Bude Urban District Council. A siding extends from the railway goods yard into the Council's land for dealing with the sand brought up by the narrow-gauge track. This is laid to a gauge of 4 ft., and comprises two classes of rail, an iron channel 4 in. wide and 3 in. deep, of an approximate weight of 60 lb. per yard, in lengths of 9 ft. 10 in., the base of this channel at the ends and the centre of each length being a little wider to admit of an iron spike being passed through for the purpose of securing the channel to the timbers or granite blocks as the case may be. The other section of rail is comprised of an angle iron 4 in. wide and 3 in. deep, approximate weight about 50 lb. per yard, in lengths of 4 ft. 11 in., with a notch in



GENERAL VIEW ON FLANGE RAILWAY AT BUDE.

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the bottom flange part at the ends to enable the channel to be spiked to the longitudinal timbers or blocks. The total length of the track in question is about 350 yards, and in addition there is a short spur road about 33 yards long by the side of the canal, also a passing loop 70 yards long.

The rolling-stock used on the track consists of tip wagons 5 ft. in length over the buffers. The wheels are plain without flanges, and run in the channels. Horses are used for the haulage of these wagons. This narrow-gauge siding was constructed a great many years ago, long before the London and South Western Railway had constructed their line to Bude.

"Underground" Extensions.

As already recorded in our pages, the associated "Underground" companies are embarking upon an important scheme of new extensious and improvement works, and Lord Ashfield has recently issued a "Memorandum" in reference thereto, and in view of the Treasury Guarantee with respect to the capital required under the Trades Facilities Act of 1921. The Memorandum has been primarily prepared to be circulated to London Members of Parliament, but includes several items of wider interest. It details first the original proposals submitted to the Government, and the alternative scheme which was sent to the Advisory Committee established under the Act on December 12, 1921. This scheme was somewhat complicated and involved much discussion and investigation before its effects and consequences could be fully explored. Meanwhile, the fall in the cost of labour and material had been considerable, and the fall in the price of money had been more rapid than could have been foreseen. The Companies had already expressed their willingness to proceed with the programme of works provided that the expenditure was not more than 75 per cent. in excess of the pre-war estimates, and the net interest cost of the capital was approximately 4 per cent. These conditions were coming within measurable reach, and accordingly it was decided to enter into an arrangement providing for the construction of the Edgware Extension of the London Electric Railway to Hendon and Edgware, the construction of the proposed connecting lines between the City and South London and London Electric Railways at Camden Town, enlargement and improvement of the City and South London line, and other associated works, in consideration of which the Treasury undertook to guarantee capital on terms set forth in detail.

Accordingly the London Electric and City and South London Railway Companies undertook to promote a Bill in Parliament in the present session to (i) extend the time for the construction of these works, for which Parliamentary sanction has already been secured; (ii) confer on the companies the borrowing and other powers necessary to increase the London Second Debenture Stock already authorised by £2,250,000, and the City Second Debenture Stock already authorised by £1,250,000; and (iii) enable the companies to charge interest to capital during construction. This Bill has now been presented to Parliament, standing orders having been suspended to enable it to proceed in the present session. When the programme of new works outlined above is completed, it will add greatly to the traffic facilities of London, for it will enable the capacity of the train service upon the sections of railway concerned to be more than doubled, and it will open up for development a new territory conveniently and pleasantly situated in the north of London. Already, in anticipation of the extension railway, roads are being laid out and houses built, and this has created employment. Contracts have now been placed for a large part of the works, and active operations will commence almost immediately. It is intended to push forward with all speed, so that in about a year the first portion will be completed and opened for public use, the remaining portion being finished in about two years from now.

On Monday, June 12, in the presence of a distinguished gathering, Sir Philip Lloyd Greame, K.B.E., M.C., M.P., who was accompanied by his wife, inaugurated the programme of new works on a site near Golder's Green station. Lord Ashfield reviewed the developments leading up to this start of actual work, and introduced Sir Philip.

"Banking" at 60 m.p.h.

MR. E. C. TAYLOR, of Taunton, Mass., U.S.A., mentions that on the Boston and Albany Railway he saw one of the Boston-Chicago expresses, booked non-stop from Boston to Worcester, 50 miles, with 4-6-2 locomotives back and front, the speed when passing Ashland being about 60 miles per hour. He describes the sight as "impressive," and suggests that banking at such a speed is unique, whether in the United States or elsewhere.

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MR. DAVID ANDERSON HENDRIE, Chief Mechanical Engineer, South African Railways and Harbours, is retiring owing to his having reached the age limit. He went to the Highland Railway as engineering pupil at Inverness at the age of 17, under Mr. David Jones. He was associated with the designing of rolling-stock from his apprenticeship in 1879, and remained as draughtsman until 1889, when he was appointed leading draughtsman of Sharp, Stewart & Co., the then well-known locomotive builders of Glasgow, and was subsequently engaged by Dübs & Co., another well-known Glasgow firm, thus gaining considerable experience in locomotive designing. In July, 1893, Mr. Hendrie became Chief Draughtsman at Inverness, and later Works Manager and Assistant Locomotive Superintendent on the Highland Railway. During this period the designs were produced of the first 4-6-0 type of goods locomotive with outside cylinders, for working over the heavy section of road, with ruling grades of 1 in 75, between Inverness and Perth. These engines were the first of the type in Great Britain. He left the Highland Railway to take up the position of Locomotive Superintendent to the Natal Government Railways, and assumed duty in Durban on January 8, 1903. He was given this position mainly on account of his experience in designing locomotives for mountainous railways, an experience which was to be extended to the African sub-continent in a greater degree than was anticipated at that time. Having early in 1904 placed his first lot of South African engines in service, classed as "Dübs B," he was instructed to design an engine which would run long distances without taking water and coal. The result was the Hendrie "B" tender engine, and so satisfied were the Government that an order was placed for 50 engines. The engines proved highly satisfactory. Up to the time of their introduction it took six different engines to haul passenger trains from Durban to the border town of Charlestown. The Hendrie "B" engine tender eliminated the use of four engines. Mr. Hendrie designed one class of engine after another, until to-day his Mallet articulated (class M.H.), the largest in the world for other than standard and broad-gauge railways, is rendering useful service in various parts of the Union. He has played a great part in reorganising the various railway workshops throughout the Union, with the result that they are to-day equipped with the latest type of plant. His retirement has been received with genuine and all-round expressions of regret.

MR. D. A. HENDRIE,

Retiring Chief Mechanical Engineer, South African Railways and Harbours.

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THE board of directors of the Great Western Railway has now reached the number prescribed for the Western Group by the Railways Act, viz., 25. The directors of the amalgamated companies who have been nominated to the Great Western

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MR. F. R. E. DAVIS,

Assistant Secretary,
Great Western Railway Company.

board are :—The Earl of Plymouth, late Chairman, Barry Railway ; Lieut.-Colonel David Davies, M.P., late Chairman, Cambrian Railways ; Lord Glanely, formerly director, Cardiff Railway ; Mr. W. Heward Bell, late Chairman, Rhymney Railway ; Mr. Graeme Birkley Forrester, late Chairman, Taff Vale Railway ; Sir Henry Mather Jackson, C.B.E., late Chairman, Alexandra (Newport & South Wales) Docks and Railway Company.

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MR. EDWARD HENRY DANNATT, formerly Superintendent of the Line of the Taff Vale Railway, has been appointed Superintendent of the newly formed Cardiff Valleys Division of the Great Western Railway, which embraces, with certain exceptions, the railway lines of the Alexandra Docks & Railway, Cardiff, Rhymney and Taff Vale systems, excluding their docks. Mr. Dannatt is the grandson of Henry Denniss, who was for over 30 years Goods Manager of the North Eastern Railway at Hull. Mr. Dannatt started railway work in the Divisional Superintendent's Office, North Eastern Railway, at Darlington in 1893. He passed through all departments including relief work at stations. Subsequently he joined the service of the Cambrian Railways as Assistant to the Superintendent of the Line, and in 1906 was appointed Commercial Assistant to the General Manager. In 1910 he entered the Taff Vale Railway service as Assistant to the Superintendent of the Line, being appointed Superintendent of the Line in 1917. Mr. Dannatt has been connected with the Railway Clearing House Conferences since 1902.

MR. E. H. DANNATT,

Superintendent, Cardiff Valleys Division,
Great Western Railway.

MR. H. J. RULE,

Assistant and Chief Clerk,
Office of the Superintendent of the Line,
Great Western Railway.

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MR. F. R. E. DAVIS, who has been appointed Assistant Secretary of the Great Western Railway, began railway service in the Accountant's Department of the South Eastern & Chatham Railway in 1901, and joined the Great Western Railway in 1902. After a short period in the Audit Office he was transferred to the Secretary's Office in 1903. In 1914 he was appointed Secretary of the London & North Western and Great Western Railways Joint Committee, and in 1919 became Secretary of the Fishguard & Rosslare Railways & Harbours Company. He served with the Colours from the first year of the war and was once decorated and once mentioned in despatches. He was demobilised in 1919 with the rank of Major in the Royal Air Force. Mr. Davis is a Professional Associate of the Surveyors' Institution, a Fellow of the Auctioneers' and Estate Agents' Institute, and has qualified for the Bar.

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MR. H. J. RULE, who has been appointed Assistant and Chief Clerk, Office of the Superintendent of the Line, Great Western Railway, entered the service at Aylesbury in March, 1879. The following year he was transferred to the Trains Section of the Divisional Superintendent's Office, Paddington. In 1902 he was Assistant Stationmaster at Paddington, and in 1904 was transferred to the Office of the Superintendent of the Line as head of the Trains and Time Table Department. In March, 1919, he became Chief Clerk to the Superintendent of the Line.

* * *

MR. H. WARWICK, who has been Superintendent of the Line, Cambrian Railways, since March, 1919, has, consequent upon the amalgamation of the Cambrian Railways with the Great Western Railway, been appointed District Traffic Manager at Oswestry, a new division having been formed in Central Wales to embrace the whole of the Cambrian Railways, Mawddwy, Van, Wrexham and Llanfair Railways. Mr. Warwick began his railway career at Gainford on the North Eastern Railway, and entered the Cambrian service in 1902.

* * *

LORD CLAUD J. HAMILTON, Chairman of the Great Eastern Railway, has been seriously ill, but now is reported to be making good progress. The late Lord Salisbury, afterwards Prime Minister, was Chairman of the board when Lord Claud joined it in 1871. Lord Salisbury was succeeded as railway chairman, first by Mr. Lightly Simpson and then by Mr. Charles Henry Parkes. In September, 1893, Mr. Parkes retired, and Lord Claud J. Hamilton became Chairman, a position he has occupied with no small amount of distinction.

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SIR JOHN A. F. ASPINALL, formerly General Manager, Lancashire & Yorkshire Railway, and Consulting Mechanical Engineer, Ministry of Transport, has received the Honorary Degree of Doctor of Engineering at Liverpool University.

* * *

MAJOR W. STORMONT, the London Manager of the Italian State Railways, has had conferred upon him by the King of Italy the Order of St. Maurice and St. Lazarus, in recognition of his services with the R.N.A.S. in the Adriatic during the war.

* * *

A WAR memorial erected at the Locomotive works, Highbridge, was unveiled on May 8, by Sir Allan Garrett Anderson (director of the Midland Railway and Somerset and Dorset Joint Committee), under the presidency of Sir Henry Fowler (Chief Mechanical Engineer of the Midland Railway, and Locomotive Superintendent of the Somerset Joint Committee). The ceremony of dedication was performed by the Bishop of Bath and Wells. At the close of the service Mr. C. Willis, chairman of the War Memorial Committee, laid a floral tribute at the foot of the monument on behalf of the locomotive, carriage and wagon department. The music was supplied by the Somerset Light Infantry Band. The memorial—a bronze tablet—was designed by a Somerset and Dorset apprentice, and was made in the Highbridge workshops, being subscribed for by the staff of the locomotive, carriage, and wagon departments. It commemorates the names of the 13 employees who perished in the war, and of the 153 who survived. The total number who served was 166. The tablet has been erected in the mess room.

* * *

AT the May meeting of the Railway Club, 65, Belgrave Road, S.W.1, with Mr. Cecil J. Allen in the chair, Mr. W. H. Froud gave a most interesting lecture on the Weymouth and Swanage services of the London and South Western Railway. The author, who has made a special study of this section of the line, dealt, among other items, with its history and physical features, and followed with an analysis of past and present train services. On May 27, by kind permission of Mr. R. W. Urie, Locomotive Engineer, London and South Western Railway, a visit was paid to Strawberry Hill engine sheds. These sheds stable about 70 engines, mostly

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employed on goods work. Amongst those seen were the latest 4-6-0 tender, 4-8-0 and 4-6-2 tank engines; also representatives of the 0-6-0 types of the Beattie period, and an interesting comparison was able to be made between the old and new classes.

* * *

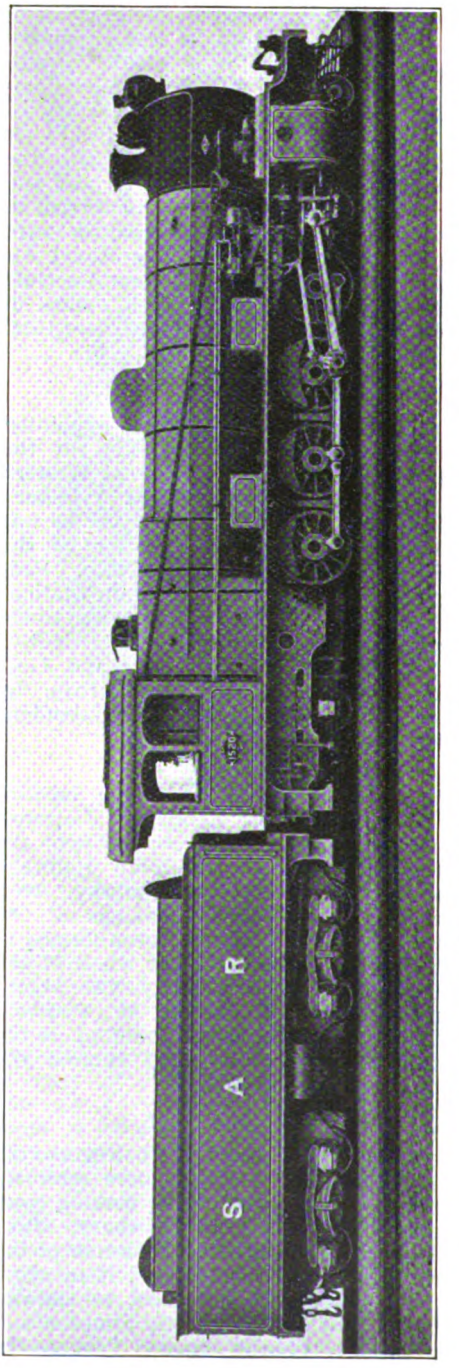
FOR the year 1922–23 the following appointments have been made by the Council of the Institute of Transport:—Honorary President, Right Hon. Lord Ashfield of Southwell; President, Sir Sam Fay; Past Presidents, Right Hon. Sir Eric Geddes and Sir Henry P. Maybury; Vice-Presidents, Sir J. G. Broodbank, Sir Lynden Macassey, Sir Henry Thornton, Messrs. H. H. Gordon, E. S. Shrapnell-Smith and Arthur Watson; Honorary Treasurer, Sir Philip Nash; Honorary Solicitor, Sir William Joynson-Hicks, Bart., M.P.; Honorary Secretary, Mr. H. E. Blain. At the express wish of the Council Mr. Blain has consented to retain the office for another year.

* * *

NUTBOURNE holiday camp, which has begun its fourth season, is an ideal spot for the railwayist as it places him in healthy rural surroundings and yet within easy reach of many attractions. The camp is situated in the south-western corner of Sussex, a few miles from the sea. Bognor, Hayling Island and its railway, Southsea, Selsey and its railway, Portsmouth and the Isle of Wight are near at hand. There is a motor-bus service to Portsmouth, Chichester, Bognor, Worthing and Brighton. RAILWAY MAGAZINE readers may obtain full particulars from J. Nobel Symington, Emerson Croft, Hambrook, Emsworth. Travellers from London book to Chichester and change there into the local rail motor to Nutbourne Halt.

* * *

ON this page is illustrated a 4-8-2 (Hendrie Class 12A) locomotive, South African Railways. This engine is representative of the latest locomotive standards introduced by Mr. D. A. Hendrie, the retiring Chief Mechanical Engineer of the Union of South Africa Railways, whose portrait is reproduced on page 75. The engines of this class are amongst the latest and largest to be constructed for the South African Railway Administration, and they are particularly noteworthy for their large proportions, especially when it is remembered that they operate on the 3-ft. 6-in. gauge. The cylinders, outside the frames, measure 24 in. diam. by 26 in. stroke. The engine in working order weighs 148 tons 0 cwt. 2 qr., together with its eight-wheeled tender. It develops a tractive force of 40,744 lb. These engines are capable of dealing with the heaviest loads met with on the system.



4-8-2 TYPE (HENDRIE CLASS) LOCOMOTIVE, UNION OF SOUTH AFRICA RAILWAYS.

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A NEW 18-hole golf course which has been laid out in Beech Hill Park, at Hadley Wood, within 10 minutes' walk of the Great Northern Railway station, was opened on Saturday, May 27. In the morning, starting at 10.15 a.m., a four-ball foursome was played—H. Vardon and Edward Ray *versus* G. Duncan and W. B. Smith, when the Hon. F. S. Jackson, M.P., director, Great Northern Railway, was referee, while in the afternoon two singles were played to establish a professional record for the course—Duncan and Vardon starting at 2.45 p.m., and Ray and Smith at 3.0 p.m. Trains left King's Cross (Great Northern) for Hadley Wood at 9.20, 10.32 a.m., 1.5, 1.11, 1.33 and 2.11 p.m.

* * *

ARRANGEMENTS have been made by the London, Brighton and South Coast Railway with the Gordon Hotels and Thomas Cook & Son, to issue combined rail, boat and hotel week-end tickets to Dieppe from Friday to Monday or Tuesday. The tickets will be first and second-class and will be available by the day or night service on the Friday, to return on the Monday or Tuesday. Passports are not required for these week-end trips.

* * *

THE Great Eastern Railway service by the Harwich-Antwerp route has, since May 31, been accelerated between London and Antwerp and Brussels, giving an earlier arrival of one hour at Antwerp and one-and-a-quarter hours at Brussels. Improved connections have been made which will give a much earlier arrival than heretofore at Cologne, Luxemburg, Strasburg and Bâle.

FROM June 1 a through carriage to Scarborough has been attached to the 1.40 p.m. luncheon car express from King's Cross each weekday. Since May 22 the through sleeping-car to Fort William on the 7.30 p.m. train from King's Cross, hitherto run on Fridays only, has been running each week-night except Saturdays.

* * *

MESSRS. JOSEPH KAYE & SONS, LIMITED, the world-famous railway carriage lock firm of Leeds, have just received an order from the British Admiralty for 1,728 of Kaye's patent seamless serrated oilcans—another of their specialities.

* * *

To congratulations on the publication of the 300th RAILWAY MAGAZINE, Mr. R. S. John adds the following concerning features of the South Eastern & Chatham Railway's train service to Tattenham Corner on Derby Day, May 31, 1922:—"There were about 50 specials train in all, including through trains composed of main line stock from Hastings, Ramsgate, Dover, Chatham and Reading. Besides these there were two Pullman car trains from Charing Cross and Cannon Street consisting of eight Pullmans each—no small load for the steep gradients between Chipstead and Tadworth. These were hauled by Nos. 812 and 817 of the 2-6-0 type, both engines having a new type of funnel, not unlike those of the '736' class of 4-6-0 on the London & South Western Railway. No. 811, of the same class, worked one of four trains composed entirely of London & South Western Railway rolling-stock. Besides the usual 0-6-0 and 0-4-4 T's, one of the large 4-4-0's, No. 773, and 0-6-4 T, No. 611, were used."

S.E. & C.R. DERBY DAY SPECIALS AT TATTENHAM CORNER STATION.

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A SOUTHAMPTON reader reports that two further 0-6-0 locomotives of the London and South Western Railway have been superheated, Nos. 694 and 350; also that Drummond 4-4-0 engine No. 314 has been superheated and fitted with a plain chimney, and further engines of this class are being similarly dealt with. Several additional 4-6-0 express passenger locomotives of the "736" class are under construction at Eastleigh.

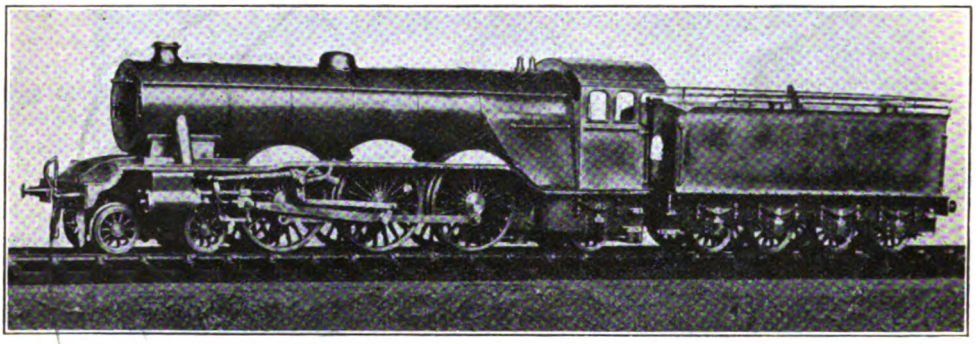
* * *

OUR Crewe correspondent writes:—W. Beardmore and Company have now completed the order for 90 "Prince of Wales" class 4-6-0 passenger engines, the final 10 of which are as follows:—Nos. 53, 197, 433, 614, 1083, 1320, 1323, 1344, 1742 and 2043. They bear Dalmuir Works Nos. 254–263 in the order given. The latest series of 0-8-0 superheated goods engines ("G2" class) to be completed bears Nos. 134, 869, 2047, 2050, 2171, 2226, 2255, 2367, 2371 and 2372. The first-mentioned is already in service, and several others will be out shortly. The "Jubilee" class four-cylinder compounds Nos. 1917 *Inflexible* and 1924 *Powerful* have been converted to two-cylinder simple, "Renown" class. Further passenger engines have been named, as follows:—"Prince of Wales" class: No. 924 *Lucknow* and No. 1290 *Premier*; "Claughton" class; No. 2230 *Clio*. Nos. 872 *Wizard* and 2182 *Giraffe* (6 ft. 6 in. 2-4-0 passenger engines) and No. 344, (5 ft. 6 in. 2-4-2 passenger tank) have been broken up. Another of the Horwich-built four-cylinder passenger engines is stationed at Crewe, viz., No. 1511. This engine, which is fitted with an eight-wheeled tender, was rebuilt in 1921.

MUCH interest is manifested in the new colours of Great Western Railway rolling-stock. The first trains to be so painted will be the "Cornish Riviera" and Torquay expresses. The remainder of the eight-wheel stock will be dealt with in turn.

* * *

AT Oxford Circus station on the Bakerloo Line there has been installed an entirely new form of ticket issuing machine. The tickets are in the form of a continuous band and are fed through the machine by the simple expedient of turning a miniature handle. The tickets fall through a glass tube into a convenient position for the passenger to pick up. The tickets are also automatically dated. This is, of course, a distinct saving of time as compared with the old-fashioned method which employed three distinct movements on the part of the booking-clerk, *i.e.*, wetting the finger with a sponge, withdrawing the ticket from a tube and dating it in a separate machine. Under the new system if a passenger at Oxford Circus asks for "ten tickets to Charing Cross," the 2d. handle is turned ten times and there are the tickets. The issuing of these ten tickets takes three seconds. The machine provides for the issue of 70 per cent. of the tickets at the station. The booking office work is further accelerated inasmuch as it entirely avoids the delay of the clerk having to constantly refill the old ticket tubes which only have a capacity of 250 tickets. The new tickets are in rolls of 1,000, and can be slipped instantaneously into the machine. There is also a numerator which enables the number of tickets of any particular denomination to be read off at any moment.



A NEW BASSETT-LOWKE MODEL LOCOMOTIVE.

G.N.R. "Pacific," No. 1470. "Great Northern."

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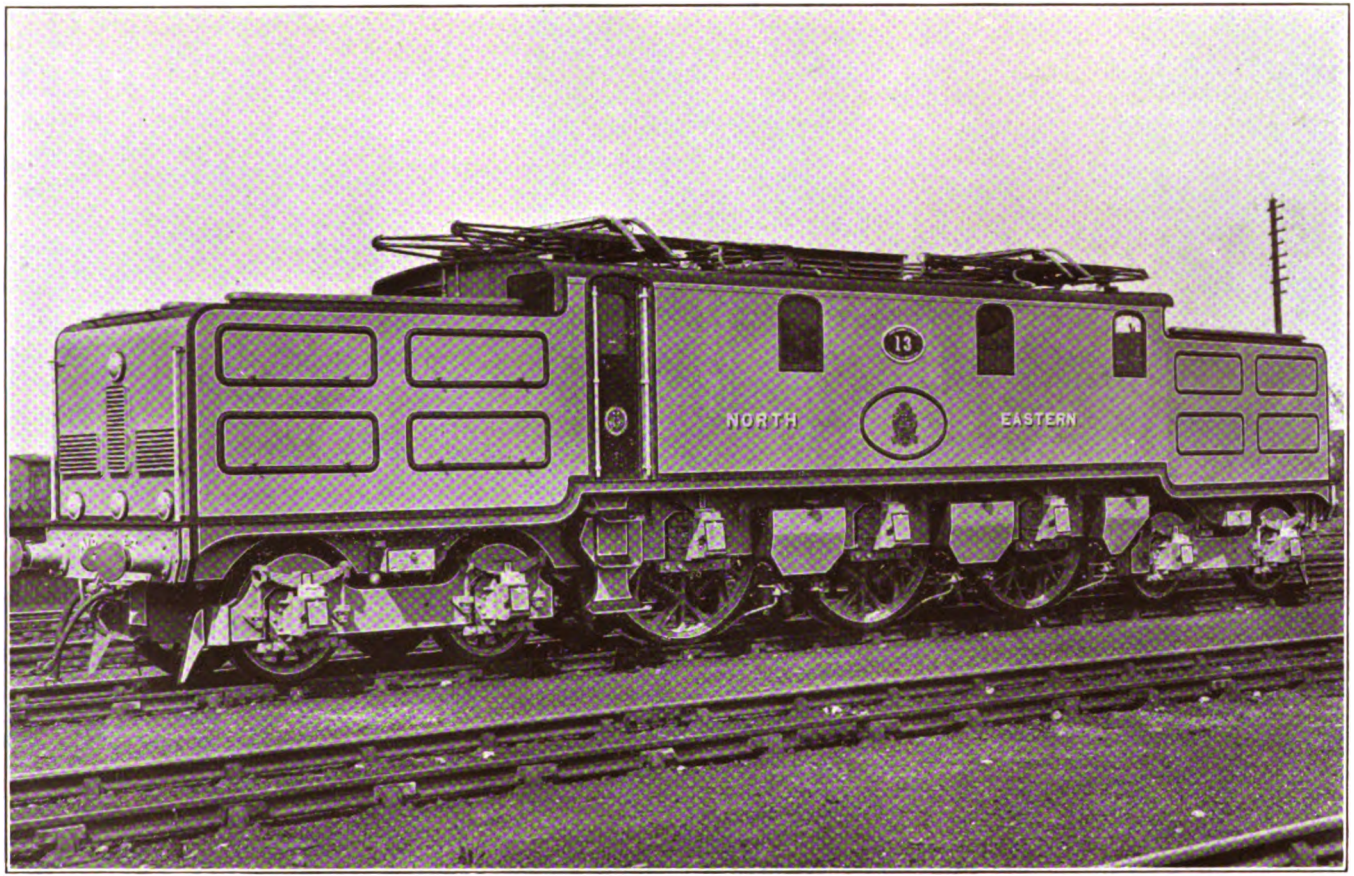

4—6—4 ELECTRIC EXPRESS PASSENGER LOCOMOTIVE, NORTH EASTERN RAILWAY.

Sir Vincent L. Raven, K.B.E., Chief Mechanical Engineer.

Designed to haul loads of 450 tons at not less than 65 m.p.h. on level straight track.

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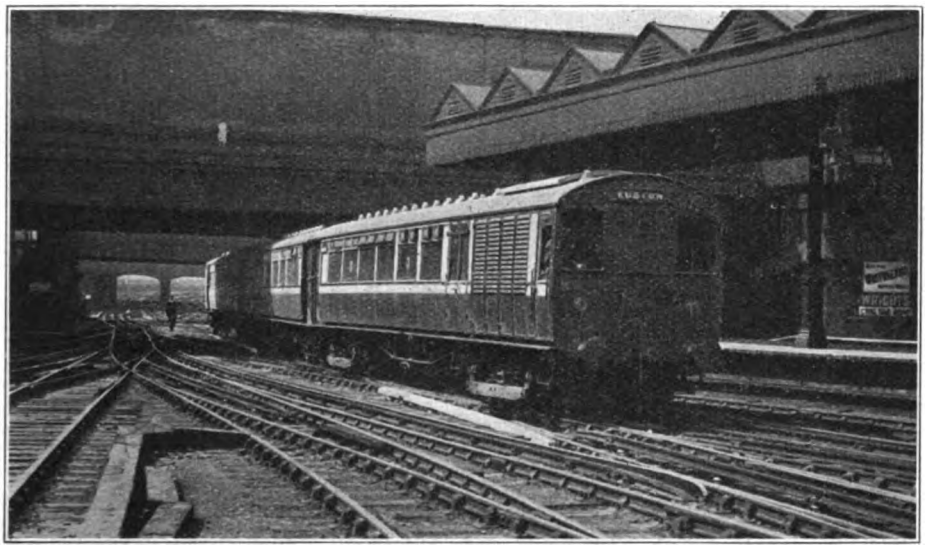

Photo.] [*Topical.*

ELECTRIC TRAIN ENTERING EUSTON STATION ON FIRST DAY OF SERVICE, MONDAY, JULY 10.

The North Western Electric.

COMPLETION OF THE LONDON AND NORTH WESTERN RAILWAY COMPANY'S LONDON ELECTRIFICATION SCHEME, AND INAUGURATION OF ELECTRIC TRACTION INTO EUSTON STATION.

ON Monday, July 10, publicly-booked electric trains appeared for the first time in Euston station, thus marking the completion of the London and North Western Railway's comprehensive electrification scheme which has been in progress during the past ten years. Had it not been for the war and the associated post-war difficulties, this work would have been completed several years ago. Indeed, the fact that so much has been done, despite difficulties, is a matter for congratulation. Work on the Chalk Farm alterations, for example, had to be suspended altogether for about four years, and it proceeded slowly for at least two more. Similarly, although London Electric trains were extended to Watford over the "New" Watford lines in 1917, these were in substitution for "joint" rolling-stock which could not be obtained from the outside firms who had the contract, or from the Wolverton carriage works, and this section was, in fact, for a time worked with Central London Railway motor coaches and London Electric trailers. There was also very serious difficulty in obtaining electrical equipment at all, while little could be done in regard to the equipment of the track or the completion of associated works until well after the conclusion of hostilities. Even the sections where electric traction was actually introduced during the war period had only skeleton services, sufficient to meet the vital needs of the stations served and to enable steam locomotives and rolling-stock to be released for war purposes, but that was all.

Happily, the conditions which thus delayed progress in this, the greatest electrification scheme put in hand to

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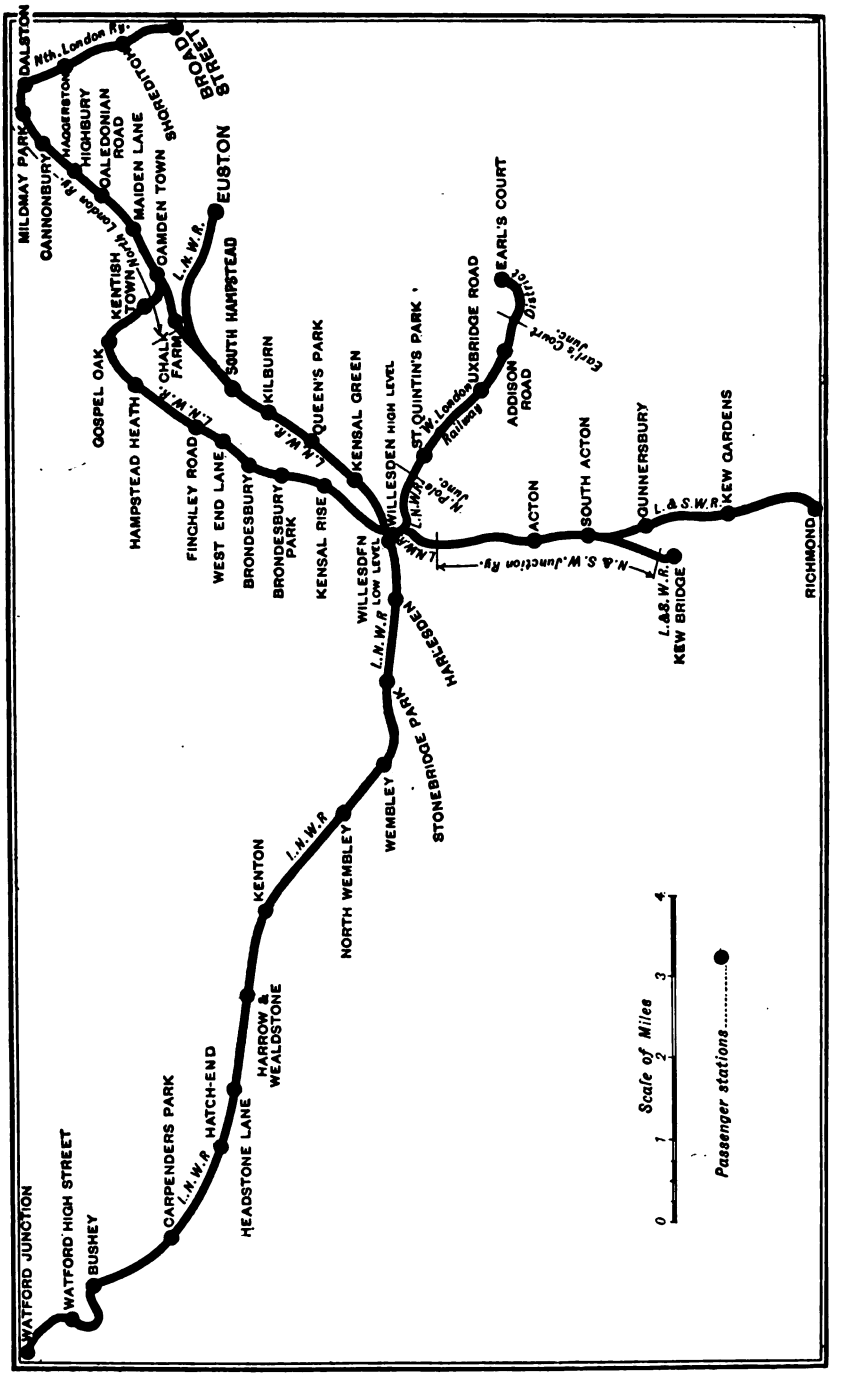

MAP SHOWING LONDON AND NORTH WESTERN RAILWAY ELECTRIFIED SUBURBAN LINES.

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meet the transport needs of the London area north of the Thames, have passed away, and with the completion of the "Chalk Farm alterations," it has now become possible to inaugurate electric traction into Euston itself, to work electric trains via the main line and from Broad Street via Chalk Farm to Willesden Junction (a service entirely suspended for several years), and to reopen Chalk Farm, Loudoun Road (re-named South Hampstead) and Kilburn stations. Queen's Park has, of course, been in use throughout, but only for London Electric trains, the basis of the works now completed. The "New" Watford lines had already been put in hand, with a diversion between Bushey and Watford to pass through Watford High Street station instead of running direct to Watford Junction. The connection with the London Electric Railway opened the way for important developments, but there still remained the problem of increasing the track capacity of the Queen's Park-Euston section, as an alternative to providing additional lines into Euston, as at first contemplated by the proposed low level tube line. Hence

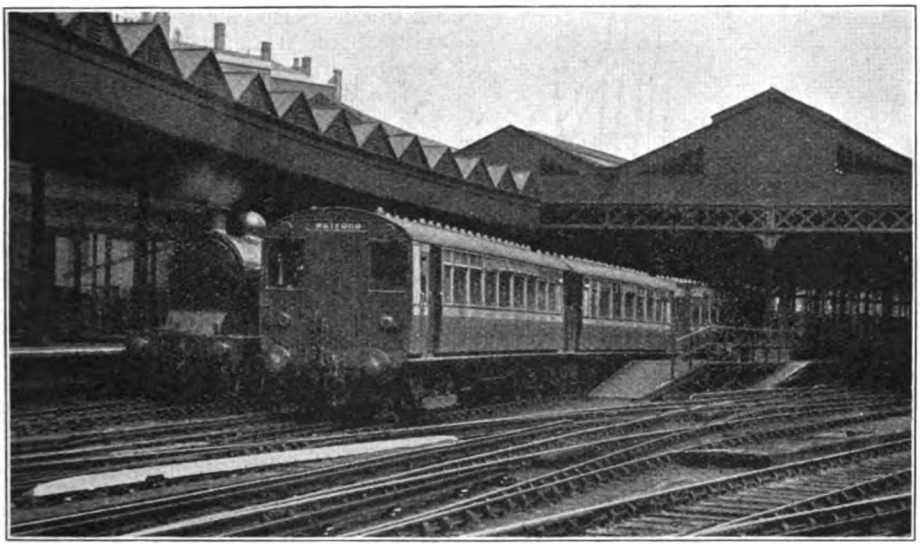

Photo.] [*Topical.*

THREE-COACH UNIT ELECTRIC TRAIN LEAVING EUSTON STATION.

which there come to the surface and join the new London and North Western lines. The new station at Kensal Green was served only by these trains, but now both that station and Queen's Park have connection with the Broad Street and Euston routes, while all the old facilities are restored on a much improved and developed scale.

The original scheme of 1907 provided for a low level "tube" railway between Loudoun Road (South Hampstead) station and Euston, with a low level "loop" station under the terminus and necessarily very severe gradients. It is, however, the 1911 scheme which really forms the "Chalk Farm alterations," designed to give, by means of a wonderful series of "over and under" non-conflicting connections in all directions, in conjunction with two new tunnels (of "tube" type), one for each of the electric lines, under Primrose Hill, substantially alongside the old tunnels, the length of which is nearly a mile.

The main features of these connections are set forth in the sketch map reproduced, from which it will be seen that by means of lines descending to pass under others, trains can now run from the North London Chalk Farm station direct to the electric lines or to the "slow" steam

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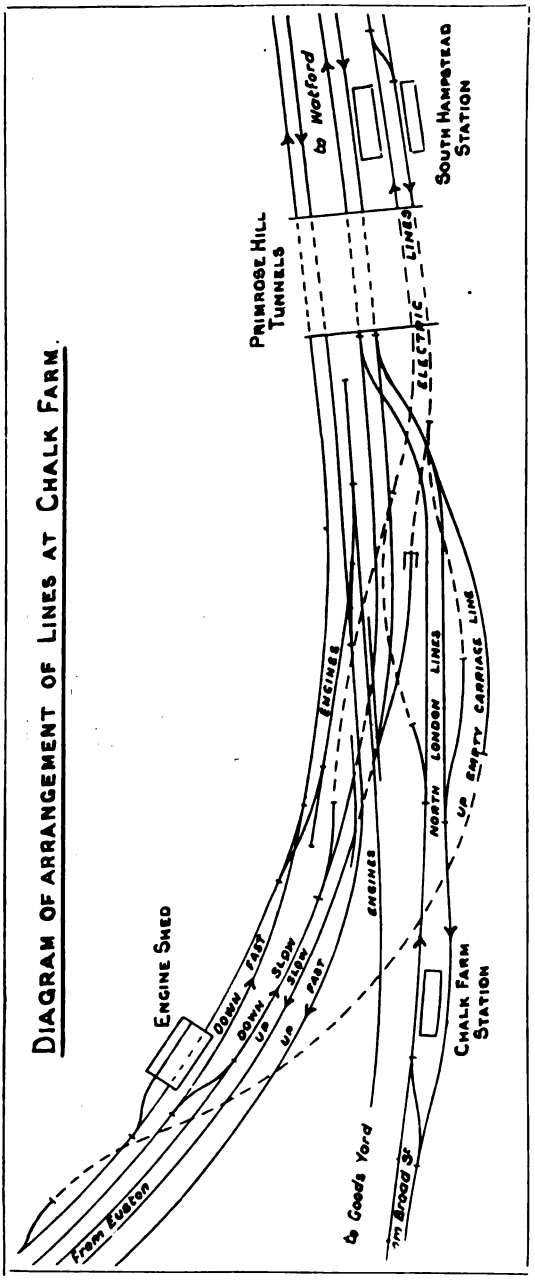
lines of the old route, or to or from the four Euston lines and the "fast" or "slow" line tunnels, or the new electric



"tubes" under Primrose Hill. A special feature is the up carriage line, carried in a section of "tube" under other lines, to facilitate the working of up empty carriage trains from Willesden to Euston without interfering with other trains. In passing Chalk Farm, therefore, electric trains from or to Euston are given convenient and unhampered access from or to the electric lines which carry them north of Chalk Farm, thus restricting their interworking with steam traffic to a minimum. Broad Street electric trains are kept entirely away from the "fast" and "slow" steam lines and from the Euston non-electric traffic altogether, thus solving the problem of dealing with a frequent service of electric trains where steam trains are also numerous in an ingenious and not unduly expensive manner. North of Chalk Farm there is no interference with steam traffic at all, as the electric services are worked entirely on new lines.

The "New" Watford lines were at first worked by steam trains, an important object being the development of traffic by means of the various new intermediate stations which have been constructed. Previously, the suburban stations north of Willesden Junction had been widely separated, there being only four, Sudbury and Wembley, Harrow and Wealdstone, Pinner and Hatch End, and Bushey, in the 12 miles separating Willesden and Watford. As a result, there were extensive intervening areas suitable for residential traffic, and as some of these districts were being tapped by lines constructed by other companies, there was every reason for bringing some of the new lines into use as early as possible.

Therefore, in June, 1912, new lines commencing from north of Kensal Green tunnel were brought into use, giving access to the "New" station at Willesden Junction, and continuing first on the east side of the main lines outside the goods sidings, and then passing under to ascend on the west side, and so to Harrow. A junction was also given from the Hampstead Junction Railway, used by Broad Street trains via Hampstead Heath. Harlesden and Stonebridge Park stations were then opened between Willesden and Wembley, and North Wembley and Kenton, thence to Harrow. This section was at first worked by steam motor trains running between Willesden and Harrow, but gradually ordinary trains were added, working through to Euston or Broad Street at busy periods.

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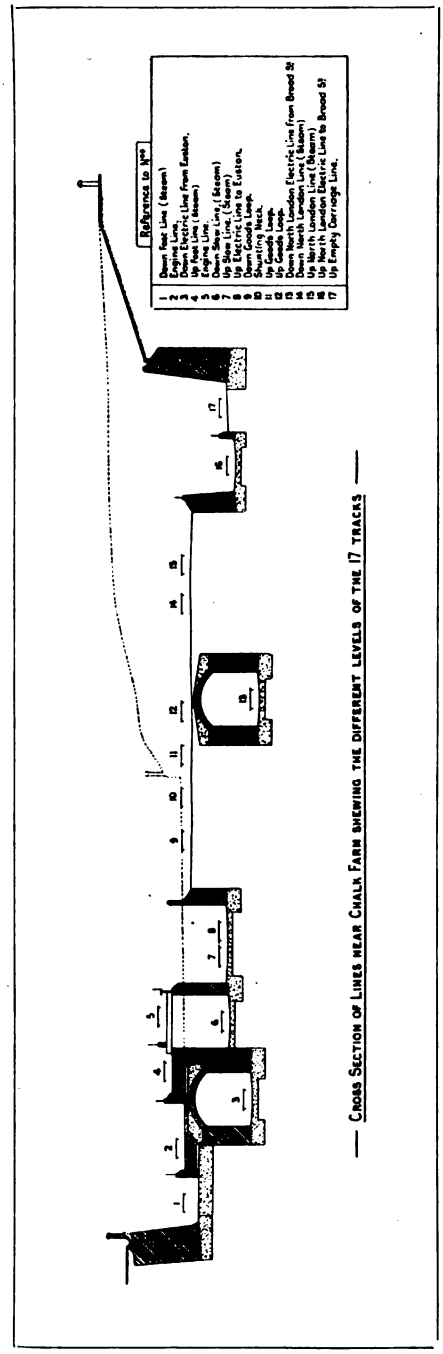
The Harrow-Watford section was opened on February 10, 1913, from which date many of the Broad Street and Euston-Watford trains were diverted, and numerous train service alterations and improvements made; the motor trains operating shuttle services between Willesden and Watford to serve the new intermediate stations. An important point was that the High Street station at Watford, in the centre of the town, was given direct services to and from London. New stations were constructed at Headstone Lane and Carpender's Park. Several of the old stations had, of course, to be enlarged and partially reconstructed, while the outstanding feature of the Bushey-Watford section is the Bushey Viaduct.

Meanwhile, equipment for electric traction had been put in hand, while the additional Kensal Green tunnel, with a new station at its south end, reconstruction of Queen's Park station and the connecting lines from the London Electric Railway were well advanced. In May, 1914, electric trains commenced to run between Willesden Junction and Earl's Court (for a few weeks District trains were employed, until sufficient sets of London and North Western electric stock were available); from May 10, 1915, London Electric trains worked through from Queen's Park to Willesden Junction; from October 1, 1916, the Richmond and Kew Bridge routes from Broad Street via the Hampstead Junction line were operated electrically, and from April 18, 1917, London Electric trains were extended through to Watford. In 1919 a few London and North Western electric trains worked through from Broad Street to Watford via the Hampstead Junction line and the connections to the "New" station at Willesden. At the end of 1920 new "Joint London and North Western and London Electric" trains were placed on the Elephant and Castle-Watford service, these compromising in dimensions between the full-sized main line rolling-stock and the London Electric "tube" trains.

Nothing further could, however, be done until the route was prepared for trains to run into Euston, the principal requisite being the completion of the extensive works at Chalk Farm. These involved the demolition of the very old main line station, but the North London station, closed during the war, is now reopened, though it can only be served by the Broad Street trains. Loudoun Road (re-named South Hampstead) and Kilburn have also been reopened.


References to Nos
Down Fast Line (Steam)
Engine Line,
Down Electric Line from Euston.
Up Fast Line (Steam)
Up Slow Line,
Down Slow Line, (Steam)
Up Slow Line, (Steam)
Up Electric Line to Euston.
Down Goods Loop.
Shunting Neck.
Up Goods Loop.
Up North London Electric Line from Broad St
Down North London Line (Steam)
Up North London Line (Steam)
Up North London Electric Line to Broad St
Up Empty Carriage Line.
— Cross Section of Lines near Chalk Farm shewing the different levels of the 17 tracks —

A TYPICAL CROSS-SECTION OF TRACK ARRANGEMENTS AT CHALK FARM, SHOWING 17 TRACKS.
These sections differ, of course, at various points.

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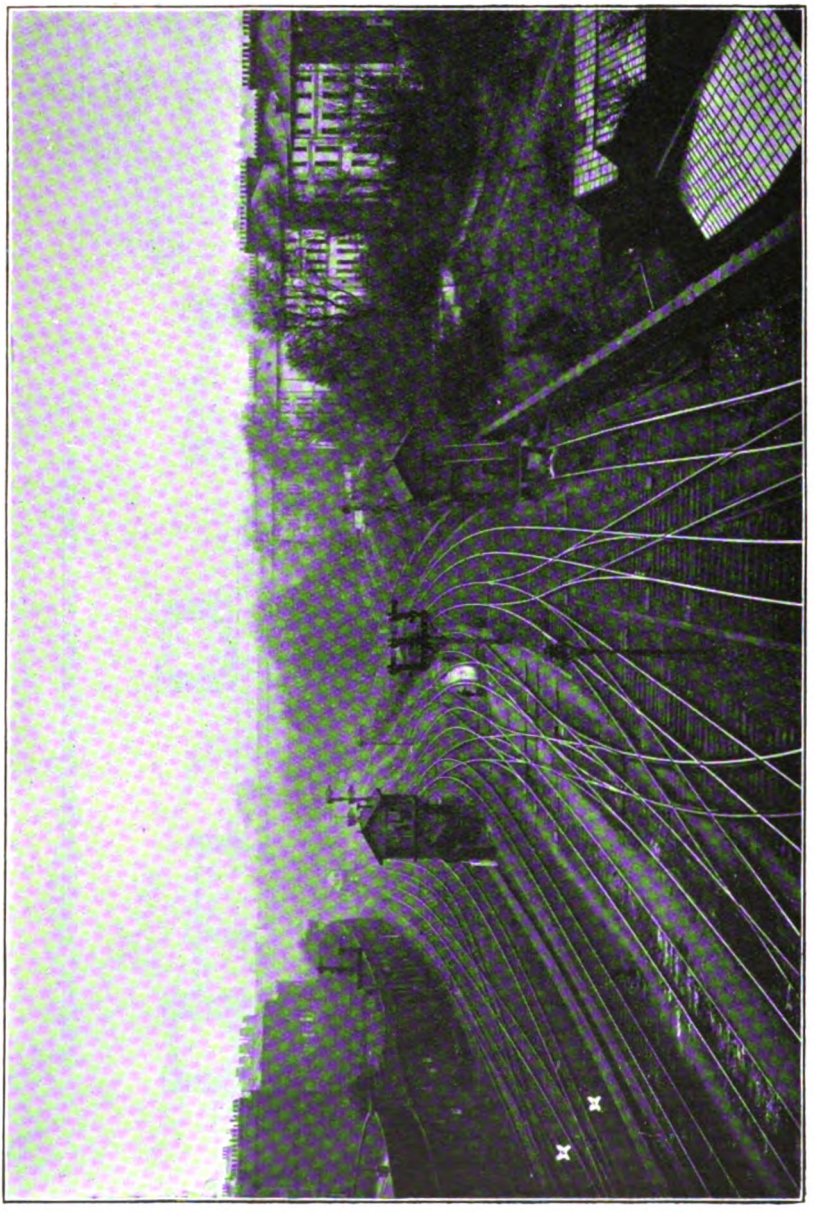

GENERAL VIEW FROM REGENT'S PARK ROAD BRIDGE, LOOKING TOWARDS PRIMROSE HILL TUNNELS IN 1913, BEFORE COMMENCEMENT OF WORK, SHOWING SURFACE CROSSINGS (x), AFFECTING MAIN LINE TRAFFIC.

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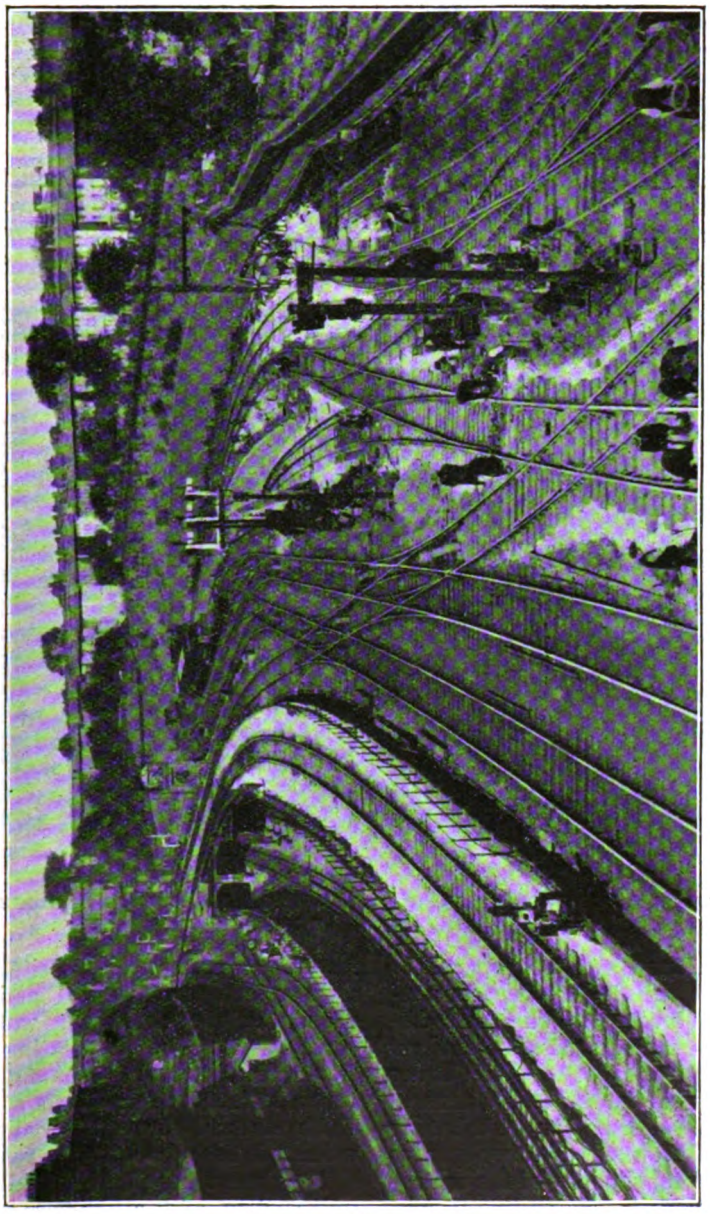

NEW TRACK ARRANGEMENTS AT CHALK FARM, SHOWING LOW LEVEL CROSSINGS TO AVOID CONFLICTING ROUTES.

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The power station at Stonebridge Park was built in 1913–14, for supplying current for the electric services, and for lighting and power purposes at Euston, Camden, Broad Street, &c. The station, together with the electric train repair and inspection sheds, coal storage ground, &c., cover an area of about 17 acres. The site will allow of the extension of the power house to a capacity of about 100,000 kw.

Coal is delivered from adjacent sidings to two ferro-concrete elevated coal gantries, the wagons discharging their contents through bottom doors into concrete hoppers beneath the roads, and from lined steel receivers situated above and at the end of the coaling gantry, so that empty wagons can be placed beneath them and the ashes discharged and taken away with a minimum of labour. There are two lines of ash suction plant each capable of dealing with 15 tons per hour.

The make-up water required for the power station is pumped by an air lift plant from two artesian wells, 500 ft. deep by 12-in. bore, the supply being drawn from the chalk belt situated some 200 to 300 ft. below the surface of the London clay. A large reservoir, holding three million gallons of water, has been

Photo.] [*Topical.*

WATFORD-EUSTON TWO-UNIT (6-COACH) ELECTRIC TRAIN AT STONEBRIDGE PARK.

which two travelling tray conveyors collect and deliver the fuel to two bucket conveyors, which elevate the fuel and discharge it into the overhead bunkers forming the upper part of the boiler house. An electric travelling jib crane is provided on the gantry for distributing or collecting coal outside the two gantry roads, and the total capacity of the coaling ground is 20,000 tons. Each line of coal conveyors has a capacity of 40 tons per hour and the internal bunkers will carry about 1,200 to 1,500 tons.

Ashes and soot are removed by a Babcock & Wilcox ash suction plant, which delivers the ashes to two concrete-formed at one end of the site which acts as a reserve supply and assists in the cooling of the circulating water for the condensers. The circulating water is drawn from this reservoir and is pumped through the condensers to a battery of eight natural draught cooling towers, whence it flows back to the reservoir.

The generating plant is laid out on the unit system, with a bye-pass steam main, allowing for inter-connection of the boiler and turbine units as required. The boiler plant comprises five units of four boilers, each capable of evaporating 25,000 lb. of steam per hour at a pressure of 210 lb. per square inch, and superheated to a

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total temperature of about 590 deg. F. Each pair of boilers has its own economiser, which is of the usual "Green" pattern. Feed water is drawn from the hot wells by five vertical compound steam pumps and delivered via exhaust steam heaters to the economisers and thence to the boilers. The feed water taken by each unit of plant is metered by an automatic "Lea" recorder. Natural draught is obtained by the use of two large brick chimney stacks, 240 ft. high by 14 ft. internal diameter.

The power station is laid out at present for five main units of 5,000 kw. and an auxiliary unit. Four of the main turbines and alternators, and the five condensing equipments are at present installed. The turbines are of the Metropolitan-Vickers "Rateau" type, coupled to English Electric Company's alternators. They have a normal rating of 5,000 kw. at a power factor 0·9, 11,000 volts 3-phase 25 cycles per second, and run at 1,500 r.p.m. The overload rating is 6,250 kw. for two hours. Each unit has its own directly connected exciter.

The condensers are of Metropolitan-Vickers surface type, each equipped with Le Blanc air pumps and water extraction pump driven by a small steam turbine, and Rees "Roturbo" circulating water pump driven by a 3-phase motor. The auxiliary unit comprises a 500-kw. 440-volt 3-phase 25-cycle alternator for supplying power to the auxiliary station motors, and a 120-kw. D.C. 220-volt generator for station lighting and switchgear control, driven by a Metropolitan-Vickers Rateau type turbine. A separate surface condenser and steam driven air and circulating pump are provided for this unit.

A motor generator set, comprising a 50-kw. stand-by exciter, a 50-kw. D.C. 220-volt generator, driven by a 3-phase motor, is provided as spare for the excitation of the main generator and for lighting and switchgear control circuits. Six 3-phase 300-kw. transformers, 11,000 to 440 volts, are provided for supply of power to various A.C. motors in the power house, train repair shops, &c. The main switchgear provides for the control of five main generators and eighteen 11,000-volt feeders, of which fourteen are at present in use.

There are ten sub-stations outside the power house, each arranged for converting from 11,000 volts 3-phase A.C. to 630 volts D.C., at which pressure current is supplied to the conductor rails. The normal equipment of the sub-stations comprises

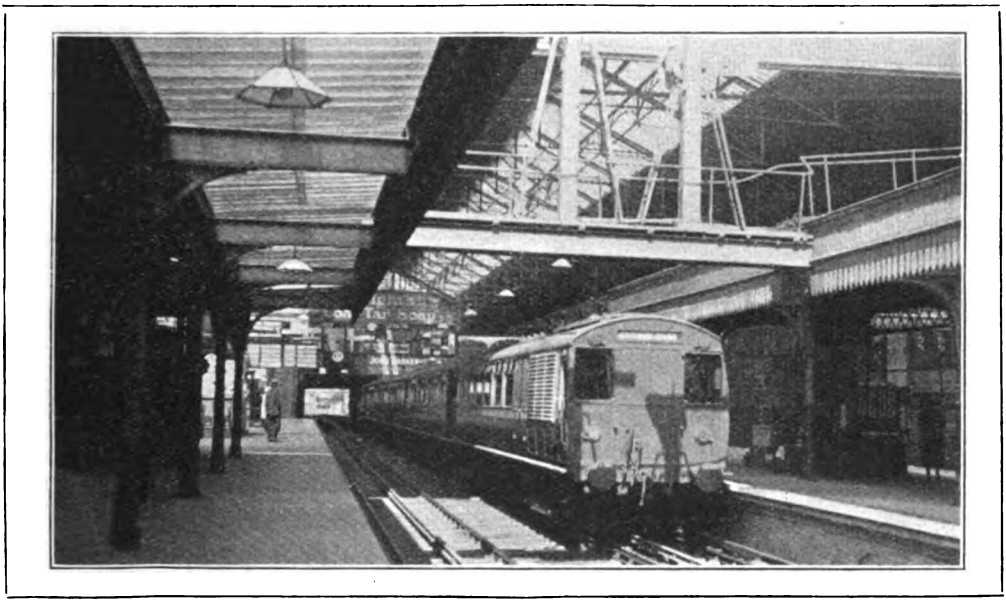

Photo.] [*J. F. Gairns.*

EARL'S COURT-WILLESDEN JUNCTION 6-COACH ELECTRIC TRAIN AT EARL'S COURT.

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three 750-kw. rotary converters and nine single-phase oil-insulated transformers. Two of the sub-stations are equipped with units of 1,000 kw. capacity, and, in addition, there are three 350-kw. "booster" rotary converters at Camden for supplying lighting and power to Euston and Camden. Each sub-station is provided with an accumulator of 300 cells, working in conjunction with a reversible booster and automatic regulator. The batteries are housed in the lower part of the sub-station building, the machines being erected on the floor above, except at Camden and Broad Street, where separate existing buildings were utilised for the batteries.

The repair and inspection shops for the whole of the electric rolling-stock are adjacent to the power station.

Rolling-stock at present comprises 80 motor coaches and 144 trailer vehicles for electric working. These are all bogie stock of the latest pattern. The motor coaches are fitted with four motors of 260 h.p. each and multiple unit control. The trains are made up of one motor car and two trailers or two motor cars and four trailers according to the traffic requirements. The maximum service speed is 45 m.p.h., the schedule speeds varying from 22 to 24 m.p.h. on the different services, and the rate of acceleration is, approximately 1·3 to 1·4 m.p.h. per second. The weight of a complete six-coach train is 224 tons and the seating capacity 326. The electrical equipment on all the London and North Western stock (excepting 12 vehicles with Siemens equipment) was provided by the Oerlikon Company. Jointly owned with the London Electric Railway are 72 all-steel vehicles for the services between Elephant and Castle and Watford. These six-coach trains have three motor cars and

Photo.] [*Topical.*

GROUP OF LONDON AND NORTH WESTERN RAILWAY OFFICERS AT STONEBRIDGE PARK.

Left to right.—Lt.-Col. F. A. Cortez Leigh (Electrical Engineer, Division "A"); Mr. C. R. Byrom (Assistant General Superintendent, Southern Division); Mr. L. W. Horne, C.B.E., M.V.O. (General Superintendent, Southern Division); Mr. A. W. Donaldson (Assistant Chief Engineer); Mr. E. F. C. Trench, C.B.E. (Chief Engineer); Mr. F. W. Dingley (Superintendent of Motive Power, Division "A"), and Mr. G. N. Ford O.B.E. (District Traffic Superintendent, London).

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three trailers, each motor car having two 250-h.p. motors.

Now that the work is completed a very liberal train service is provided. The first train leaves Watford at 4.50 a.m., and the last at 11.7 p.m. In the opposite direction the first train leaves Euston for Watford at 6.5 a.m., the last train departing at 12.10 night. Euston electric trains during normal hours run about every 30 minutes, but during the " peak " hours additional trains are provided, affording in the up direction between 7.0 a.m. and 10.0 a.m. a quarter-hour service, Watford to Euston, and between 4.0 p.m. and 7.0 p.m. a similar service, Euston to Watford. On Sundays the service to Euston is half-hourly, commencing with the 8.30 a.m., Watford to Euston, and terminating with the 10.30 p.m. Similar services to Watford leave Euston from 9.23 a.m. to 10.53 p.m. A suitable service of trains to the stations between Watford and Tring has also been arranged, these trains running in connection with the London trains to and from Watford.

A through service, Watford to Broad Street, via Chalk Farm, is given on weekdays every quarter of an hour from about 7.0 a.m. to 10.0 a.m. and a similar service from Broad Street to Watford from about 4.0 p.m. to 7.0 p.m. During the slacker times of the day a half-hourly service via Chalk Farm, is in operation from Broad Street to Willesden, passengers joining at the latter station the Elephant and Castle or Euston to Watford trains. They can also travel from Broad Street to Willesden by the quarter-hour service from Broad Street to Richmond. The arrangements on a Saturday include extra trains to cope with the residential traffic from London, mid-day and early afternoon.

An important feature of the additional electric train services afforded between Watford and Euston is that it has allowed scope for improving the services given by express steam trains. Amongst these may be mentioned a new non-stop train (Saturdays excepted) leaving Watford at 9.30 a.m., and arriving Euston 9.52 a.m., whilst among other accelerations the 8.5 a.m. from Watford, due Euston 8.48 a.m., has been re-timed to leave at 8.15 a.m., and arrives Euston as before, *i.e.*, an acceleration of 10 minutes. The residential resorts north of Watford, *i.e*,. King's Langley, Boxmoor (for Hemel Hempstead), Berkhampsted, &c., also benefit by additional and accelerated trains.

On Friday, July 7, a press inaugural trip was run from Broad Street at 11.10 a.m., thence, *via* Chalk Farm, to Watford, proceeding to the car sheds and returning to the power station at Stonebridge Park. After lunch, the party travelled to Euston station, where platforms Nos. 4 and 5 have been equipped to receive the electric trains. Mr. L. W. Horne, M.V.O., C.B.E., Divisional Superintendent (Southern Division), explained, after lunch, the general features of the work involved and the main characteristics of the train services to be provided, emphasising the fact that until the Chalk Farm alterations it had been impossible to inaugurate electric working to Euston and, *via* Chalk Farm, to Broad Street. Among the various officers attending the inaugural trip (Mr. A. Watson, C.B.E., General Manager, was prevented from being present) were, besides those shown in the group reproduced on page 90:—

Mr. A. R. Trevithick, C.B.E., Divisional Carriage Superintendent, Wolverton; Mr. E. G. Oliver, Outdoor Assistant to Mr. Trevithick; Mr. J. A. Milligan, M.B.E. (Commercial Assistant to Divisional General Superintendent Southern Division); Mr. L. D. Parsons (Outdoor Assistant to Divisional General Superintendent, Southern Division); Mr. J. Shoppee (Assistant District Traffic Superintendent, London); Mr. P. Woolley (Assistant District Traffic Superintendent, London); Mr. G. Broughall (Electrical Department, Division A); Mr. J. Franck (Electrical Department, Division A); Mr. W. Dobson (Electrical Department, Division A); Mr. O. E. Kinsman (Locomotive Department, Crewe); Mr. G. Firbank (Locomotive Department, Willesden); Mr. S. W. Burleigh (Divisional Hotels Manager, Euston); Mr. H. A. Neate (Superintendent, Dining Car Department, Euston). Messrs. D. H. F. Meacock and F. Hare, of the London and North Western Publicity Department, were also present.

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High Speed Main Line Passenger Electric Locomotive, North Eastern Railway.

BY courtesy of Sir Vincent L. Raven, K.B.E., Chief Mechanical Engineer, North Eastern Railway, we are enabled to reproduce as frontispiece a photograph of the new high-speed passenger electric locomotive designed by him and erected at the company's works, Darlington. The electrical equipment was supplied by the Metropolitan-Vickers Electrical Company and manufactured at Trafford Park, Manchester.

The locomotive has the 4–6–4 wheel arrangement. Referring to this engine in his recent paper on "Electric Locomotives," presented at the Paris meeting of the Institution of Mechanical Engineers, Sir Vincent Raven explained that it had been designed and built for experimental purposes, and that the conditions specified for the electrical equipment were as follows :—

1. The adhesion weight of the locomotive will be not less than 17 tons per driving axle, and the complete elec rical equipment shall be such that the motors can exert sufficient torque to skid the wheels without injury to themselves or to any part of the equipment.

2. The motors shall be able to exert a total average tractive effort of 16,000 lb. at the tread of the driving wheels when starting under normal conditions on level track.

3. The capacity of the complete equipment shall be sufficient to enable the locomotive, when coupled to a train weighing 450 tons, to start from rest on a rising gradient of 1 in 78 and accelerate up to the first economical running speed without injury to any part of the equipment.

4. The speed of the motors and gearing shall not exceed the limits of safety when the locomotive is travelling at 90 miles per hour.

5. The locomotive shall be capable of hauling a train of 14 main line coaches weighing, with load, 450 tons, at not less than 65 miles per hour on straight level track.

The electrical equipment consists of three pairs of motors, in which each motor has a capacity of 300 h.p., so that the total capacity of the locomotive (1 hour rating) is 1,800 h.p. measured at the tread of the wheels. The use of three pairs of motors enables a wide range of speed to be obtained by grouping the six motors—(1) all in series; (2) three in series, two in parallel; (3) two in series, three in parallel. With each grouping provision is made in the control equipment for regulating the speed by reducing the excitation of the motor fields. Thus there are for each grouping four different degrees of excitation, namely, full field, 18 per cent. reduction, 31 per cent. reduction, and 40 per cent. reduction. With this arrangement, 12 different speeds are available for any particular value of the tractive effort.

Each pair of motors is mounted in the locomotive framework immediately above the corresponding driving axle. Concentric with this axle is a hollow shaft or quill, carrying at each end a spider. The arms of this spider mesh with the spokes of the driving wheels and are connected to them by springs called "the quill springs." The quill carries a gear-wheel which engages with the two pinions of the pair of motors. The quill runs in "suspension" bearings which form part of the motor frame, and the distance between the gear centres is thus definitely maintained. This arrangement allows a pair of motors to be geared to a single driving axle through a flexible connection, allowing the axle to move up and down on the axle-box guides without transmitting the movement to the motors, and thus reducing the deadweight on the track to a minimum.

The locomotive is equipped with a small boiler for producing the steam necessary for the heating of the passenger coaches. Steam is produced electrically and, so far as is known, this is the first electric boiler, used for the purpose named, in which the heating elements are designed for direct current at a pressure of 1,500 volts. The boiler is of the fire-tube type, each tube containing a heating element consisting of a tube of quartz in the interior, of which there is a spiral of high resistance wire. The boiler contains in all 144 of these elements, and switchgear is provided so that the number of elements in circuit can be reduced as desired when the full output is not required from the boiler. The maximum output is 1,000 lb. of steam

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per hour at a pressure of 120 lb. per sq. in.

The main particulars of this interesting locomotive are :—

Wheel arrangement	4-6-4.
Electrical system	Direct current.
Voltage	1,500.
Length, overall	53 ft. 6 in.
Width, overall	8 ft. 10 in.
Height, pantograph locked down	13 ft. 0⅛ in.
Driving wheel diameter	6 ft. 8 in.
Bogie wheel diameter	3 ft. 7¼ in.
Rigid wheelbase	16 ft. 0 in.
Weight of locomotive	102 tons.
Weight per driving axle	18 tons 10 cwt.
One hour rating—	
Tractive effort	15,900 lb.
Speed	43 m.p.h.
Horse-power	1,800.
Continuous rating—	
Tractive effort	9,480 lb.
Speed	51·5 m.p.h.
Horse-power	1,300.

A TYPICAL CANADIAN LOCOMOTIVE.

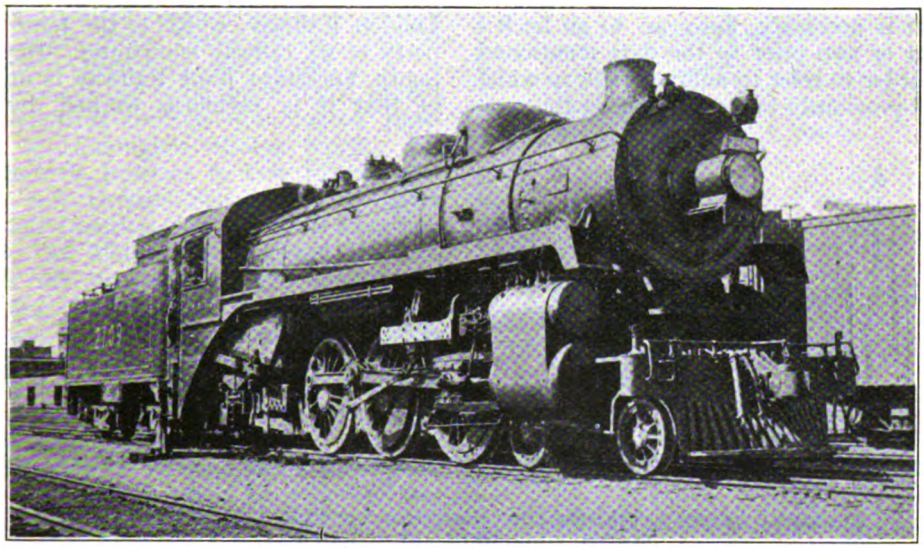

Photo.] [*C. J. R. Littlebury.*

CANADIAN PACIFIC RAILWAY LOCOMOTIVE, NO. 2709.

BY the courtesy of Mr. C. J. R. Littlebury, we are able to illustrate and provide the dimensions of a Pacific type Canadian Pacific Railway locomotive, Class G4A, built in 1920, at the Angus shops, Montreal, which were illustrated and described in the RAILWAY MAGAZINE, March, 1922, pages 151–155 inclusive. Mr. Littlebury's photograph was taken at Calgary.

Leading dimensions are :—

Boiler pressure	200 lb.
Cylinders	24½ in. by 30 in.
Diameter of driving wheels	70 in.
Tractive effort	42,600 lb.
Firebox length (inside)	111⅛ in.
Firebox width (inside)	84⅜ in.
Flues	38 5½-in.
Tubes	205 2¼-in.
Length between tube sheets	18 ft. 4⅞ in.
Firebox heating surface	258·5 sq. ft.
Arch tubes heating surface	39·6 sq. ft.
Tube and flue heating surface	3,232 sq. ft.
Superheating surface	803 sq. ft.
Total equivalent heating surface	4,734 sq. ft.
Grate area	65 sq. ft.
Factor of adhesion	4·26
Weight on drivers	181,500 lb.
Weight on engine truck	59,100 lb.
Weight on trailing truck	58,400 lb.
Total weight of engine	299,000 lb.
Tender weight (loaded)	178,100 lb.
Coal capacity	12 tons.
Water capacity	8,000 gals.

NOTE.—A Canadian ton equals only 2,000 lb.

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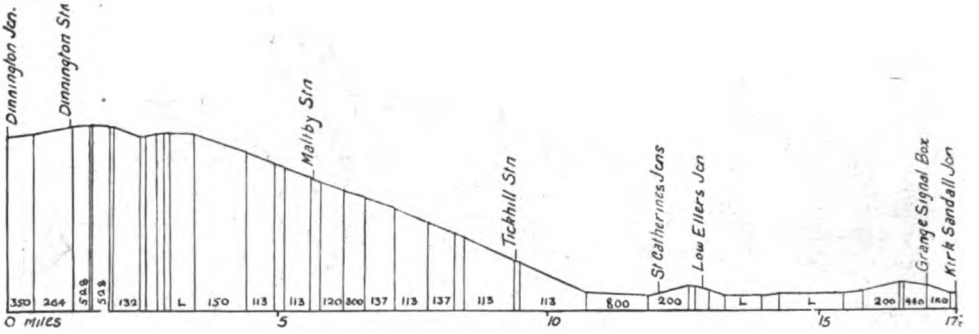
The South Yorkshire Joint Railway.

By H. L. HOPWOOD.

OF late years much activity has been displayed in the promotion and construction of new railways in the vicinity of Doncaster, chiefly for the purpose of opening up extensive but, as yet, little-developed coalfields. The South Yorkshire Joint Railway, the subject of this article, was formed in 1903, more particularly to serve the coal producing area south-west of Doncaster.

It is necessary, however, to go back a year or two prior to the date mentioned, in order to refer to another railway which had previously broken ground in the same district. On August 9, 1901, a Bill was passed incorporating the Shireoaks, Laughton and Maltby Railway, whose line was to reach Dinnington and Maltby collieries from the south by means of a connection from Brantcliffe Junction, west of Shireoaks, on the Retford–Sheffield section of the Great Central Railway. A joint Great Central and Midland undertaking, it was opened for coal traffic as far as Laughton and Dinnington colliery in January, 1905.

In addition to the Great Central and Midland Railways, whose joint line came from the south, the Great Northern, Lancashire and Yorkshire and North Eastern Railways each possessed plans of their own for reaching the district from the north. Subsequently, all of these companies came together in the promotion of a joint system, and the Bill authorising the "South Yorkshire Joint Railway," as it was called, received Royal Assent on August 14, 1903 The five companies mentioned subscribed similar amounts and each has equal rights with the others over the line. It will thus be seen that the railway is very much a "joint" one; in fact, we recall only one instance of its ownership number being exceeded—that of the East London Railway, which is the joint property of six railway companies. But the South Yorkshire Joint Railway is unique in that it is regularly worked by *all* of the owning companies' engines and trains.



GRADIENT PROFILE, DINNINGTON JUNCTION TO KIRK SANDALL JUNCTION, SOUTH YORKSHIRE JOINT RAILWAY.

Construction of the railway began in November, 1905, at Rotherham Lane, Laughton; the terminating point of the line previously made from Brantcliffe Junction. The northern half of the latter (*i.e.*, from Dinnington Junction to Rotherham Lane, and also the Dinnington Colliery branch) was, by agreement, transferred to the South Yorkshire Joint Committee. The main line therefore starts at Dinnington Junction and extends to Kirk Sandall Junction, on the Doncaster–Stainforth section of the Great Central Railway, a distance of 17½ miles. There are branches from Laughton East to Laughton West, linking up at the latter place with the Great Central, Hull and Barnsley and

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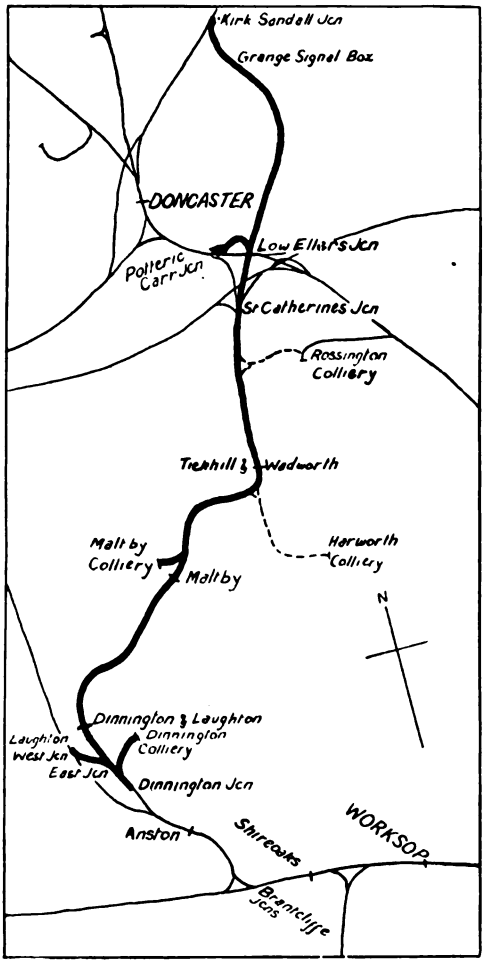
Midland Joint Line; from Low Ellers to the Great Northern main line at Potteric Carr; and also to Dinnington and Maltby Collieries; additions which bring the total mileage of the system to 20 miles 35 chains. The Joint Committee also has powers to construct lines to Harworth and New Rossington collieries.

At St. Catherine's Junction there are two connections to the jointly-owned Dearne Valley Railway. One going east is a joint Great Northern and Lancashire and Yorkshire line, and the western spur is owned by the Lancashire and Yorkshire Railway. At the same point of junction a third connection diverges; this belongs to the Great Northern Railway and leads to that company's down Decoy sidings, but at present no permanent way is laid.

The main line is of single track, except the following sections—Dinnington Junction to Dinnington Station North; St. Catherine's Junction to Low Ellers Junction and Grange Signal Box to Kirk Sandall Junction; all of which have two lines. At Maltby and Tickhill stations, loops are provided for the purpose of crossing trains. The total double line mileage (main line) amounts to 4 miles 27 chains The branches from Low Ellers to Potteric Carr (56 chains) and from Laughton East to Laughton West (41 chains) are also double tracked.

Primarily to be regarded as a colliery line, the South Yorkshire Joint Railway was opened for mineral traffic on January 1, 1909, and, as previously mentioned, all of the five owning companies work their engines and trains over it. Passenger trains commenced running on December 1, 1910, when a service was instituted between the Great Northern station at Doncaster and the Great Central station at Shireoaks. These trains (four each way) served the three South Yorkshire stations and also that at Anston, on the Great Central and Midland Joint line The Great Central and Great Northern Railways equally provided engines and carriages, but after running for nearly a year, the two Great Northern trains were withdrawn, and from that time the Great Central has been the working company for this traffic. During the war, and until April, 1920, passenger trains were restricted to running on Saturdays only. Since the date mentioned the service has been extended beyond Shireoaks, to Worksop, this being a more important station and one into which Midland trains run from and to Mansfield. At the present time there are two trains each way between Doncaster and Worksop from Mondays to Fridays, and three each way on Saturdays. The distance between the points named is 21 miles 51 chains. North of Low Ellers Junction the South Yorkshire Joint Railway is used only by mineral trains.



SOUTH YORKSHIRE JOINT RAILWAY AND CONNECTING LINES.

Despite the presence of coal workings, the surrounding scenery is as yet unspoiled; Maltby Colliery, for instance, being almost hidden in a wood. Soon after clearing Doncaster, some hilly country is traversed; a fact demonstrated by a long uphill climb,[1] and by the frequency with which cuttings and

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embankments are encountered. A point some four miles from Doncaster marks the beginning of the steep ascent just referred to; and this extends to Dinnington. Except for a short piece of level, followed by a short fall at 1 in 200 near Dinnington station, the line rises for 9½ miles, principally at 1 in 113, 137 and 150.

The three intermediate stations are all built in similar style, with buildings of red brick. That at Maltby is the largest, having platforms 450 ft. long and 15 ft. wide. The heaviest cutting occurs between Dinnington and Maltby stations: extending for half-a-mile, its greatest depth is 57 ft. Another cutting nearer Dinnington measures three-quarters of a mile long and 32 ft. deep. At the village of Brookhouse the railway is carried across a road by a viaduct 40 ft. high and on a curve of 34 chains radius. Approaching Doncaster from the south, the line runs over Black Carr embankment for 2½ miles and is then taken across the Dearne Valley and Great Northern Railways by two viaducts. That spanning the first-named railway has three girders, each 40 ft. wide, but the viaduct over the Great Northern main line is a much longer structure, there being in this case 13 spans; twelve of these are 28 ft. wide, and one—that bridging the Great Northern running lines—is 60 ft. wide. The permanent way is formed of 95 lb. British standard section rails, secured to sleepers 2 ft. 8 in. apart, except at joints, where the spacing is reduced to 2 ft.

Each owning company is represented on the directorate of the South Yorkshire Joint Railway by two Directors. The secretary to the Joint Committee is Mr. H. Marriott, now of the London & North Western Railway, Euston, and the Traffic Department is in charge of Mr. W. Briggs, who is designated Traffic Inspector. His offices are at Bank Chambers, Doncaster.

It may be mentioned that this railway is the third to adopt "South Yorkshire" as part of its title. The original South Yorkshire Railway, incorporated in 1847, was absorbed by the Great Central Railway in 1874. The second company with a very similar title is the South Yorkshire Junction Railway, which dates from 1890 and is worked by the Hull and Barnsley Railway.

A STUDY IN CHIMNEYS.

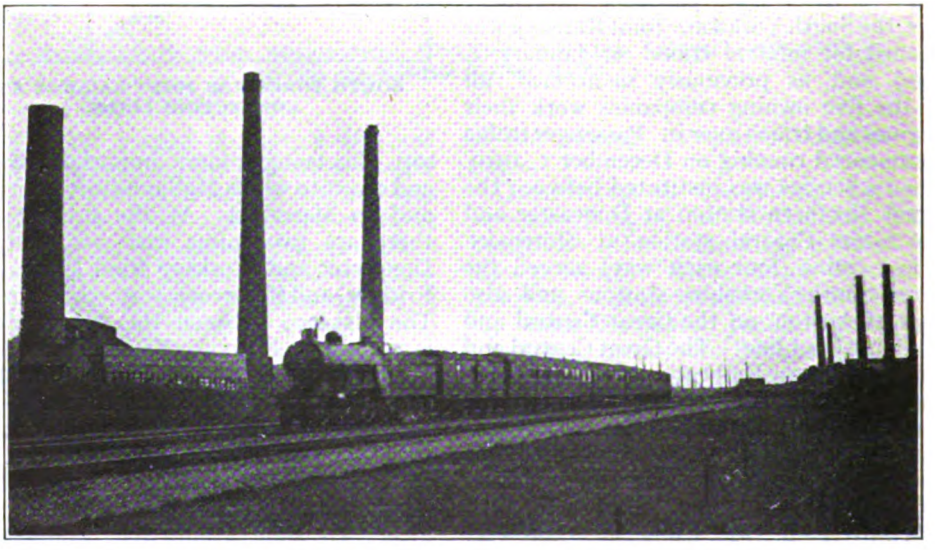

Photo.] GREAT NORTHERN RAILWAY. [*S. J. Hitchborn.*

3.0 p.m. down express near Fletton Junction, Peterborough. 4-4-2 locomotive No. 1408.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN, A.M.Inst.T., A.I.Loco.E.

Photo.] [*W. Rogerson.*

NORTH EASTERN RAILWAY.

Up East Coast Express passing Croft Spa.
Two-cylinder 4-4-2 engine No. 702 (Class V.)

IT is quite clear that, unless I make a valiant effort to overtake arrears of locomotive performance, there are many praiseworthy examples of running, which I have been privileged to record during the journeys of recent months, that will never see the light of publicity in these columns. So, this month, "practice" must make way for "performance," and will perhaps do so with a better grace in that I have some notes to put on record of the work of certain of the very latest creations of British locomotive practice. In particular, I want to refer to the running, first of Mr. R. H. Whitelegg's magnificent new 4-6-4 express tank engines on the Glasgow and South Western Railway; then of Mr. Pickersgill's first venture in three-cylinder propulsion on the Caledonian Railway, by No. 957, the second of its class; and, finally, I have to describe a "test" journey, which I was fortunate enough to experience when travelling south from Scotland, wherein one of Mr. G. Hughes' fine four-cylinder 4-6-0 engines was set to run from Carlisle down to Crewe with a specially made up load of over 400 tons, including dynamometer car, and did some magnificent work. All these runs I have tabulated in company, both with contemporary journeys, and also with trips of pre-war years, for purposes of comparison. Those who wish to refer back to the dimensions and particulars of the locomotives concerned will find all details of the Glasgow and South Western Railway tanks in the July issue, of the Caledonian three-cylinder 4-6-0 express engines in the October, 1921, issue, and the superheated 4-6-0 Lancashire and Yorkshire (now London and North Western) engines in the May, 1921, issue of the RAILWAY MAGAZINE.

The capacity of Mr. Whitelegg's new tanks I sampled on the service for which they have, I believe, been mainly designed—the Coast expresses between Glasgow and Ayr. Of these the chief from the speed point of view, of course, are the 5.10 p.m. from Glasgow to Ayr, and the 8.25 a.m. return morning train, both covering the 41·4 miles non-stop in 50 min., at an average speed of 49·7 m.p.h. The route covered is, however, an easy one from the grading point of view, the only difficulties being the awkward curves between Glasgow and Paisley, and the service slack through Gilmour Street Station at the latter place. This being so, one is tempted to wonder why all the other

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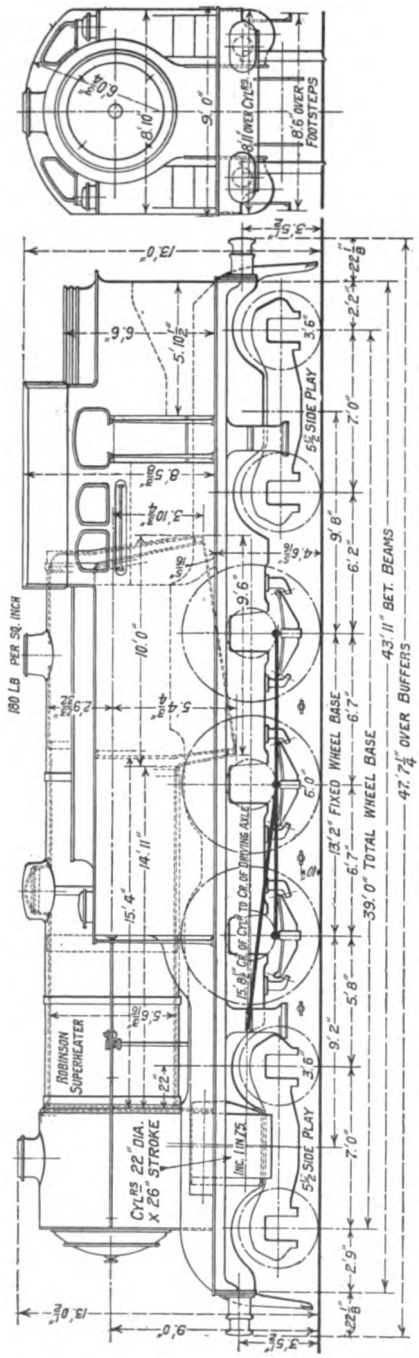
trains on this service, and the companion services to Ardrossan, Fairlie and Largs, should run to such exceedingly leisurely timings, with the sole exception of the 1 p.m. non-stop to Ayr on Saturdays—



DIMENSIONED DIAGRAM OF NEW TANK ENGINE, GLASGOW & SOUTH WESTERN RAILWAY.

another 50-min. express—and the 12.30 p.m. ex-St. Enoch, which is timed over the 33·7 miles from Paisley to Ayr in 41 min. daily. The latter is the train figuring in the first column of the table, when a 4-6-0 express engine was provided to work a very light load, and, although keeping time, made a poor show, never getting nearer to the mile-a-minute rate than 58½ m.p.h. at Dalry. No. 136, one of the Drummond 6 ft. large-boilered 4-4-0's, did worse on the 5.10 p.m. down, and dropped 2 min. by exceedingly feeble running, in addition to 3 min. loss by signals between Paisley and Elderslie.

Those runs were in 1913; the performances of No. 540, the pioneer of the new "stud," tell a very different story. The first two trips were made when the engine was hauling the average winter load—two 12-wheelers and five 8-wheelers on the first occasion and three "twelves" and three "eights" on the second—and we performed the allotted task with ridiculous ease, despite very cautious running as far as Elderslie. On both trips a rate of exactly 50 m.p.h. was maintained up the rising grades from Elderslie to near Howwood, but whereas on the first we touched 61 m.p.h. at Dalry, 62½ before Irvine, and 61 again from Prestwick to Newton, not falling below 53 all the way from Howwood to Newton, on the second the driver ran almost without steam from Beith to Glengarnock, and slacked with unaccountable—and apparently unnecessary—care, to 40 m.p.h. over Barassie Junction. So, whereas on the former run we had a comfortable minute in hand on arrival, on the second, despite the more brisk start, we were ¼ min. late.

The third of the 4-6-4 runs was on the summer service, and I found the express now swollen to a ten-coach corridor train, including a 12-wheeled tea-car, 304 tons empty and 320 tons full—a very much altered proposition from the haulage point of view. It struck me as unique, however, that, with the sole exception of the start, there was absolutely nothing in the running to indicate the slightest alteration in the load behind the engine—a remarkable tribute to the "flexibility" in working of the new machine. Once again the speed up to Howwood was exactly 50 m.p.h., and again the speed from there to Prestwick, where we were

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slowed for p.w. repairs, was always between the limits of 55 and 64 m.p.h. The 19·7 miles from Beith to Prestwick were run in 20 min. 5 sec., and we should have arrived with ¾-min. in hand but for the concluding delay; 3½-min. (net) were regained between Elderslie and Ayr, but the schedule from Glasgow out to the former place is manifestly of impossible tightness.

Coming back, I made three journeys on 25 sec., mounted the 2½ miles past Kilbirnie (1⅛ at 1 in 100 and ⅞ at 1 in 200) at a minimum of 41 m.p.h., touched 61 at Lochwinnoch, and maintained 53 m.p.h on the subsequent 2⅝ miles up, chiefly at 1 in 250-300. On the second trip, again behind No. 542, the Amateur Golf Championship at Prestwick necessitated a special stop at that station, with an eleven-coach train (of lighter stock) crammed with passengers and weighing

G. AND S.W.R.: 5.10 P.M. GLASGOW-AYR EXPRESS.

Distance.	Engine No.: / Engine: Type: / Load (tons, tare): / Load (tons, full):	Schedule.	*386 / 4-6-0 / 168 / 180	*136 / 4-4-0 / 195 / 210	540 / New 4-6-4 Express Tank. / 194 / 210	190 / 210	304 / 320
Miles.		Min.	m. s.	m. s.	m. s.	m. s.	m. s.
0.0	St. Enoch	0	¶ 0 00	0 00	0 00	0 00	0 00
1.6	Shields Road ..	3	4 30	4 25	4 05	4 00	4 30
4.2	Cardonald	—	7 55	7 35	7 25	7 15	7 50
7.7	Paisley (G. St.) ..	10	12 50	11 50	11 40	11 15	12 00
				Sigs.			
9.7	Elderslie	12	4 45	16 45	14 20	13 55	14 50
10.9	Johnstone	14	6 25	18 50	15 45	15 25	16 20
13.8	Howwood	—	10 20	22 45	19 10	18 55	19 50
18.6	Beith	24	16 10	28 40	24 30	24 10	25 15
23.3	Dalry	29	21 25	33 55	29 35	29 35	30 10
26.8	Kilwinning ..	33	25 05	37 45	33 10	33 15	33 50
30.2	Irvine	37	28 40	41 20	36 35	36 55	37 10
34.9	Troon (Goods) ..	42	33 45	46 40	41 35	42 30	41 50
38.3	Prestwick ..	—	37 25	50 25	45 05	46 15	45 20
							p.w.r.
40.2	Newton	—	39 30	52 40	47 00	48 20	48 15
41.4	Ayr	50	41 20	54 55	49 05	50 15	50 15
41.4	Net times (min).	50	51½	52	49	50½	49½

* Original Numbering. ¶ 12.30 p.m. express, calling at Paisley.

the 6.20 p.m. express from Ayr which, despite a substantial load, and the fact of taking the steeply-graded "loop" at the back of Castle Semple Loch, from Dalry to Elderslie, yet leaves drivers of the new engines in some difficulty as to how to fill out a time of 51 min. from Ayr to Paisley. This assumes a stopping allowance of 3 min. at Paisley, on which the working time-table is not clear. On the first run, with No. 542 and a load of ten bogies weighing 280 tons all told, we started very sluggishly to Irvine, taking a minute over the 17 min. allowed, but then ran from Irvine to Dalry in 8 min. fully 290 tons; to the stop we ran in 6 min 40 sec., and after a 35-sec. halt, picked up well, and were doing over 54 m.p.h. at Irvine, passed in 12 min. from Prestwick. Irvine to Dalry took the same time as previously, and our speed at the three points mentioned on the "loop" were 35, 57 and 43½ m.p.h. respectively. So the times on the two trips were 4 min. 35 sec. and 5 min. from Dalry to Kilbirnie, 3.7 miles, 4 min. 20 and 50 sec. thence to Lochwinnoch, 3·5 miles; 4 min. 50 and 55 sec. on to Kilbarchan, 4·2 miles; 1 min. 30 and 35 sec. more took us through Johnstone North, 1·3 miles; but, having

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time in hand, on both trips we simply crawled in over the curves through Elderslie to Paisley, 3·8 miles, signals being against us, in 8¼ min. and 6 min. 50 sec. respectively. Total times over the 34·6 miles from Ayr were therefore 49 min. 55 sec., or 47 min. net, and 50 min. 50 sec., or 49¼ min. net, including in the latter case the special stop at Prestwick. Eliminating the latter, the net time would be again 47 min., or 4 min. under schedule.

Running on the third trip, with No. 541 and 245 tons, was terribly poor to Paisley, the time being 51½ min., but then some

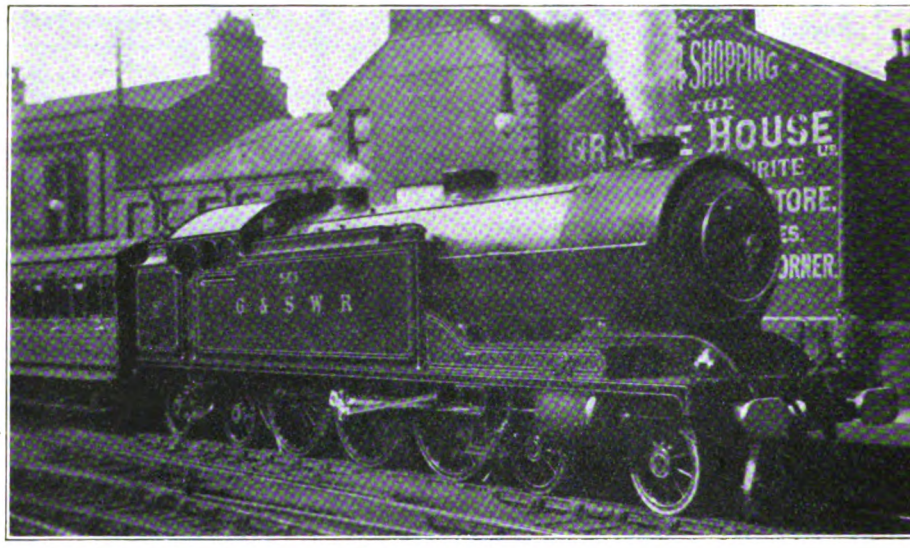

Photo.] GLASGOW & SOUTH WESTERN RAILWAY. [*W. T. Anderson.*

4-6-4 Tank Engine No. 543 at St. Enoch Station, Glasgow.

brisk running was made between stops, Paisley to Shields Road, 6·1 miles, taking 9 min. 20 sec.; Shields Road up to Eglinton Street, 0·6-mile, 2 min. 35 sec.; and Eglinton Street into the terminus, 1 mile, 3 min. exactly. With economy in stopping times, the allowance of 24 min. from reaching Paisley to stopping at St. Enoch was thereby cut to under 20 min. A summary of the best times on these three runs indicates a total of 65¾ min. from Ayr to St. Enoch, three intermediate stops and the Kilbirnie route included, against a booking of 75 min.—a pretty sure indication that some of these times could do with drastic cuts, following on the introduction of the new engines.

In addition to this route, the 4-6-4 tanks are now working regularly on the London trains over the tremendous gradients between Glasgow and Kilmarnock; for the present the 4-6-0 express engines, with their large tender capacity, continue to undertake the working over the easier road between Kilmarnock and Carlisle. Up till now I have only had one journey behind one of the new tanks over this route, and that was when the 9.25 a.m. out of St. Enoch was loaded up to the heavy total of 13 corridor 8-wheelers, a 12-wheeler "diner" and a 6-wheeler, weighing 357 tons empty and 375 tons "all found." In these circumstances the driver of No. 545 was unwilling to tackle Neilston bank without a pilot (which is not surprising, in that the 4-6-0 engines are limited to 225 tons over this section), and we, therefore, attached in front the Manson rebuilt 4-4-0 No. 348. Strathbungo, 1·9 miles, was passed in 4 min. 20 sec., and Nitshill, 5·9 miles, in 9 min. 35 sec., at 53½ m.p.h., attained over gradually rising grades; the 5 miles of Neilston bank, two-thirds of which rise at 1 in 67-70, and the rest at 1 in 100, brought us down to 35½ m.p.h., so that we took 11 min. 35 sec. to Barrhead, 7·6 miles, 15 min. 20 sec. to Caldwell, 12·7 miles, and 22 min. 35 sec. to Lugton, 14·4 miles, passed 1½ min. in advance of

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time. But we went so cautiously down the bank from beyond Dunlop, passed 3 min. later, to Kilmarnock, that the full 24·4 miles to the stop occupied 34 min. 55 sec., the maximum speed being not allowed to rise above 62½ m.p.h. It is generally at least 10 miles higher, past Kilmaurs. I shall look forward to timing an unpiloted run over this length under ordinary conditions.

We now come to the work of Mr. Pickersgill's massive three-cylinder 4-6-0, No. 957, from Carlisle out to Beattock. With it I have tabulated, for comparison, tion workings beyond Summit I have not tabulated, as the running on the falling grades towards Carstairs is now so consistently leisurely as to have little interest.

But first of all a word as to grades. The initial ⅜-mile from the start is a useful descent at 1 in 100 ; after a slight rise to 2 miles, gradual falling grades ensue to the Solway bridge at 7¼ miles. From here the line rises 985 ft. vertically in a distance of 42½ miles. The early part of this ascent is at 1 in 193-203 to Brackenhill Summit at 22 miles, broken only by 3 undulating miles from 14¾ to 17¾ miles,

Photo.] GLASGOW & SOUTH WESTERN RAILWAY. [*Chas. S. Lake.*

4–6–4 Tank Engine No. 543 entering St. Enoch Station, Glasgow.

three other trips on the Glasgow portion of the 10 a.m. ex-Euston ; a fast pre-war run behind McIntosh's 4-6-0, No. 49, prior to superheating ; two recent runs behind a Pickersgill 4-4-0 superheater, and a McIntosh superheated 4-6-0 respectively ; all these were without pilot or banking assistance from Beattock to Summit. Then follow three striking trips, the first on the 1.30 p.m. from Euston behind another Pickersgill 4-4-0, and the second a pre-war journey on the then 2 p.m., in which figured the superheated McIntosh *Dunalastair II*, No. 772, with a colossal load ; and, lastly, the fastest time I have ever recorded out of Carlisle, with two 4-4-0's working a 56-axle train through to a stop at Summit. Continuapast Kirtlebridge. From Brackenhill the fall is at 1 in 200 to 23¾ miles, and thence at 1 in 528 past Lockerbie to 29¼ miles, after which follows a slight rise steepening from 1 in 880 to 326, and an equally slight fall past Wamphray to just beyond 35½ miles, where the River Annan is crossed. Here Beattock bank really begins, but the initial 4¼ miles of it, to the 40th mile post (Beattock Station) are mostly at 1 in 202. In the next 9¾ miles, however, the line rises almost exactly 650 ft., at a gradient varying exclusively from 1 in 69 to 1 in 88, and averaging 1 in 79. From 44¼ miles (a mile below Greskine Siding, down side) to the top is the steeper part of the bank, averaging about 1 in 74.

No. 49 did some very smart work with

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a light train, touching 64½ m.p.h. before Gretna, and 72½ beyond Lockerbie; minimum rate at Summit was 26½ m.p.h., and quite brisk running followed, with a maximum of 74 m.p.h. at Lamington, so that the 13·5 miles from Summit to Lamington were reeled off in 12 min. 55 sec. and Symington, 66·9 miles from Carlisle, was reached in 81 min. Yet this was, *mirabile dictu*, four minutes *over* the strenuous 77 min. then scheduled! No difficulty was experienced, however, in cutting the subsequent allowance of 59 min. o 25½ m.p.h. at 46 miles, and remained between there and the slightly higher rate of 27 the rest of the way up. From Summit the train was run at a very leisurely pace down to Lamington, speed barely reaching 60 m.p.h. anywhere, and reached Symington in 87 min. 40 sec. from Carlisle. It will be noticed that No. 116's time from Beattock to Summit was 5 sec. less than that of No. 49.

No. 906, with an almost identical tonnage (differently made up, as an early 8-wheeler and a 6-wheeler replaced one

CALEDONIAN RAILWAY: CARLISLE TO BEATTOCK SUMMIT.

Distance.	Engine No.:	49	116	906	957	86	772	120P
	Engine: Type:	4-6-0	4-4-0	4-6-0	4-6-0	4-4-0	4-4-0	4-4-0
	Load (tons, tare):	200	222	229	244	315	375	402
	Load (tons, full):	210	235	240	260	330	395	420
Miles.		m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
0.0	Carlisle	0 00	0 00	0 00	0 00	0 00	0 00	0 00
4.1	Rockcliffe	6 30	7 05	7 05	7 15	6 45	7 05	6 30
8.6	Gretna	10 50	11 55	11 40	11 55	11 25	11 45	10 45
13.0	Kirkpatrick	16 05	17 45	17 00	17 15	17 05	17 10	15 35
16.7	Kirtlebridge	20 35	22 35	21 20	21 45	21 45	21 50	19 45
20.1	Ecclefechan	24 20	26 30	24 50	25 20	25 30	25 40	23 10
25.8	Lockerbie	30 15	33 05	30 40	31 30	31 50	32 05	28 50
28.7	Nethercleugh ..	32 45	35 55	33 25	34 15	34 30	34 50	31 15
31.7	Dinwoodie	35 35	39 05	36 30	37 20	37 10	37 40	33 55
34.5	Wamphray	38 05	42 05	39 40	40 25	39 55	40 35	36 30
39.7	Beattock	43 45	47 55	45 25	46 20	45 45	47 15	41 40
45.3	Greskine Box ..	54 25	57 50	56 55	57 25	†12 40	†12 15	51 00
49.7	Summit	‡63 55	‡68 00	‡68 45	‡68 00	†22 05	†21 25	*60 05

* To dead stop. ‡ Passing Time. † Passing times from Beattock Station.
P Piloted by 4-4-0 No. 896.

on to Glasgow by 9 min., whereby a late start of 1½ min. from Carlisle was converted to an arrival in Glasgow 3 min. before time! The apparently good time of 20 min. 10 sec. from Beattock to Summit on this trip was nearly 2¼ min. over the exacting 18 min. then allowed.

No. 116 did quite well on the present schedule with six bogies of the heaviest 8-wheeled stock and a dining car; speed before Gretna was 59 m.p.h., at Kirtlebridge 56½ and beyond Lockerbie 62½; up the ascents to Brackenhill the sustained rate was 41½, and, better than this, the same incline up to Beattock Station was surmounted at 50½ m.p.h. On the famous bank itself speed fell by degrees of the large 8-wheelers of the previous run) did better to Beattock, and not so well thence to Summit, speed falling to 21 m.p.h. on the upper part of the bank. But we had passed the Solway at 62½ m.p.h., Kirtlebridge at the same speed and Nethercleugh at 65; and the minima on the two stages of the ascent to Brackenhill had been 47½ and 50½ m.p.h. respectively. Travelling again easily after Summit, we passed Symington in 87 min. 35 sec., and drew up at Motherwell (conditional stop) in 115¼ min. A stop of 65 sec. here, and a "crawl" onwards to Glasgow, could not prevent us from arriving at 6.21½ p.m., 3½ min. early by working times, and 8½ min. early by advertised times.

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Seeing that both the West and East Routes, by the way, now have trains booked, in the former case to Glasgow and in the latter to Edinburgh (9.50 a.m. down) in 8 hr. 25 min., it is indeed a mystery that the public should not be allowed to benefit by the knowledge. Every time that I travel by the 10 a.m. from Euston to Glasgow, and we arrive, as we usually do, at any time between 6.20 and 6.25 p.m., I notice agitated persons, as I am walking off the platform, who have come to meet what they imagine to be the 6.30 p.m., and find that the train has been in some time already. Similarly is it at Edinburgh Waverley with the 9.50 a.m. from King's Cross, booked in at 6.15 p.m., and advertised at 6.20 ; although things are certainly not quite so bad now as when these times were, for one post-war summer, 6.38 and 6.50 p.m. respectively !

Photo.] **CALEDONIAN RAILWAY.** [*W. A. Millar.*

10 a.m. *ex*-Glasgow entering Aberdeen Joint Station. McIntosh 4–6–0 locomotive No. 905.

Now we come to No. 957's effort. Truth to tell, it was a little disappointing, although, in the combination of circumstances that the engine was newly in service and therefore not being strained in any way, and also that the train was dead on time from the start, more could not be expected. We touched 61½ m.p.h. at the Solway, 60 at Kirtlebridge and 64½ at Lockerbie ; fell to 45½ m.p.h. at milepost 14, and 49 at Brackenhill ; crossed the Annan at 60 and passed Beattock at 47½ ; passed Auchencastle (Box, 41½ miles) at 30 m.p.h., Greskine at 25½ and Harthope (47¾ miles) at 23½, after which speed recovered to 25½ at Summit. These times and speeds were not, of course, exceptional, but at the same time it was clear from the comparatively muffled sound of the exhaust (I was in the third coach from the engine) that No. 957 was not being worked at anywhere near her full capacity. The usual gentle running ensued from Summit, Symington being passed in 87 min. 20 sec., and Glasgow being reached dead on the booked time of 6.25 p.m., despite two very severe signal checks and the conditional stop at Motherwell.

The next two runs have a strong likeness in the matter of times, but there was a considerable difference in loads, No. 772, much the smaller engine of the two, making a most tremendously plucky fight with a huge train of all but 400 tons. On the latter journey (during the early part of the war), the speed at the Solway was 62½ m.p.h. and on the two stages of Brackenhill ascent 44 m.p.h. was the minimum rate, which indicates that the little engine must have been developing over 1,300 h.p., although the figure is not exactly ascertainable in that speed was still inclined to fall at Brackenhill Summit.

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After stopping at Beattock for a "banker," a speed of 31 m.p.h. was attained on the grade, but fell back to 29 for the bulk of the climb and finally to 27½ at Summit. After that a fairly brisk descent took us through Symington in 89 min. 25 sec., including 3 min. 20 sec. standing at Beattock. There is no doubt of course, that No. 772 was being worked very hard all the way at Beattock. Delays ruined the conclusion of the run.

No. 86's trip is quite recent, and though inferior to the one just described, shows up well the capabilities of Mr. Pickersgill's fine 4-4-0 engines. Maxima were 61½ m.p.h. at Solway, 65 at Lockerbie, and 69 at Nethercleugh; minimum rate up to Brackenhill was 43; on shutting off for Beattock stop we were still going at 50½ m.p.h. After attaching a bank engine (0-4-4 tank type) and exchanging No. 86 for superheated *Dunalastair II* No. 769, we attained 30 m.p.h. on the bank, but fell back to 25½ at Summit; thence we passed Lamington, 13·5 miles, at 67 m.p.h. in 14 min. 10 sec., Symington, 17·2 miles, in 17 min. 50 sec., and stopped at Carstairs, 23·8 miles, in 25 min., or 47 min. 5 sec. from Beattock (allowed 46 min.). From Carstairs very easy running, with the Glasgow portion only, brought us into Glasgow in 39 min. 35 sec. (allowed 42 min.) despite signal checks, and thus we arrived ½ min. early.

The last column shows the fastest start I have ever recorded out of Carlisle, McIntosh superheated 4-4-0 No. 120, with *Dunalastair III* No. 896, being the engines responsible. We touched 69 m.p.h. before Gretna, 64½ at Kirtlebridge, and sustained 74 after Lockerbie; on both portions of the ascent to Brackenhill we sustained 52½ m.p.h., and then, crossing the Annan at 68, we were still doing 55½ as we passed Beattock, and never fell below 31½ m.p.h. before shutting off steam to stop at Summit. Seeing that the load was exactly double that carried by No. 49 in the first run, this was really a performance of extraordinary merit, and I couple it with that of No. 772 in the previous column as the two finest runs, by a wide margin, in the table. Despite 5 sec. over 4 min. standing at Summit, where the pilot came off, we passed Symington in 82 min. 40 sec. from Carlisle and Carstairs in 89 min. 20 sec.; indeed, No. 120, with the 420 tons and unaided, passed Strawfrank, 23·5 miles from the top, in 24 min. 35 sec. from the start; but as I have previously described the run in these columns—in January, 1914—I will refrain from further details.

And now, at last, I come to the exploits

Photo.] CALEDONIAN RAILWAY. [*W. A. Millar.*

Up Postal Express leaving Aberdeen Joint Station. McIntosh 4-4-0 Superheater locomotive No. 42.

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of No. 1657—late Lancashire and Yorkshire and now London and North Western superheated four-cylinder 4-6-0—on the 12.8 p.m. express from Carlisle to Crewe consisting of seven 8-wheelers and a dining-car on arrival at Carlisle, and made up there specially with a dining car and five more 8-wheeled cars to a total of 58 axles, 403 tons tare load, and, as nearly as I could estimate, 415 tons gross behind the tender. The latter, by the way, is at present one of the 8-wheeled Lancashire and Yorkshire variety, weighing in working order, full, 41½ tons, in order to carry sufficient coal and water for trips of this length. The runs tabulated in company with the test run are the best pre-war examples I can find in past notebooks of journeys behind other classes of engine, unpiloted, with anything like corresponding loads; thus a "George" 4-4-0 figures in the first column, a "Prince" in the second, and I am only sorry I am unable to turn up a "Claughton" trip made under comparable conditions. The last column sets out another "Prince" run, of quite recent date, on the same train as the test train but with a normal load, in which the times over unchecked lengths of level and uphill were the fastest I have ever recorded in this direction of running.

But let me take the test trip first. Getting away from Carlisle up the continuous 1 in 131 to Wreay, although the engine was starting "cold," we were gradually accelerating the whole way, and passed Wreay at all but 40 m.p.h.—39.1 to be precise—speed being still inclined to rise. This must have involved a horse-power output of fully 1,510 (based on the 39·1 m.p.h.) and probably over. By comparison, *John Bateson* had reached 34½ and *Andromeda* 36 m.p.h. at this point. Up the easier 1 in 184, terminating with ¼-mile level, to Southwaite, we rose to 47½ m.p.h., while the subsequent 5½ miles up at 1 in 228 (2⅞)—172-164 brought us down again to 45. Nearly 2 miles level now produced a maximum of 54, and the next 2 miles up, rising at 1 in 186, reduced the rate to 48½ m.p.h. It is clear that the engine was here eased materially, as on the level and slightly falling grades past Penrith we did not get above 56½ m.p.h., while on the rising grades beyond Eamont Bridge speed began to fall so rapidly that, after ascending at 1 in 192 only, for 2 miles, to Clifton, we had got down to 41 m.p.h. at that station, and the subsequent 7⅛ miles at 1 in 125 reduced us to 34·6 m.p.h.; nevertheless we recovered before the conclusion of the last-mentioned grade to 36 m.p.h., and rose to all but 37 on the subsequent 1⅜ miles up at 1 in 142.

Photo.] **CALEDONIAN RAILWAY.** [*W. A. Millar.*

Pickersgill 4–4–0 superheater engine No. 80 at Aberdeen.

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The ⅝-mile level past Shap brought us up to 42½ m.p.h., and the minimum on the final 1¼ miles at 1 in 106-130 to Summit was 39·7. So we had accomplished a magnificent ascent, in nearly 4½ min. under schedule time, despite the easing of the engine, which was evidently enforced to prevent our getting too far ahead of the booking.

As regards the comparison runs, *John Bateson* tied with No. 1657 from Plumpton to Shap Station, falling to a steady 34½ m.p.h., and finally to 33½, on the 1 in 125; while *Andromeda* did some very fine work, in consideration of the size and power of the engine concerned, not falling below 36 m.p.h. This superiority was due to the above-mentioned easing of No. 1657, although when the latter was opened out towards the summit of the bank, it was to make the best time of the three from Shap to Summit. So far as the downhill running was concerned, it was a "crawl" on the part of 1657, to avoid getting too much ahead of time, but despite the easiest of running throughout to Preston, complicated by a dead slowing for p.w.r. works at Carnforth, and a full stop of 1¼ min. at Brock for the same reason, we were yet only 40 sec. behind time on arrival. Net time I reckon at between 106 and 107 min., and had we emulated the fine work of *John Bateson* between Lancaster and Preston—on the basis of previous running an easy possibility—as well as the latter's downhill speeds, we might have made Preston in 103 min., or 12 min. below schedule. *Andromeda* was driven more easily, being almost on time from the start, whereas *John Bateson* left Carlisle 7¾ min. late, and passed Preston 2½ min. early, according to the working times then ruling!

South of Preston it should be borne in mind that No. 1657 was starting from rest, with a 46-axle train now weighing 324 tons empty and 335 tons gross (after the loss of three coaches for Liverpool and Manchester), whereas the other two engines were *passing* Preston and continuing with their 375-ton trains. No. 1657's booked time to Wigan is designed for a train averaging in weight about 170 tons; yet we observed it with 335 tons behind the tender. The steepest parts of the rise to Coppull Summit are ½-mile at 1 in 106 to Farington, ½ at 110 from Leyland, and 1¾ at 106-115 from Balshaw Lane; Leyland bank commences with ¾-mile at 1 in 265, is at 1 in 314 between the Farington 106, and the Leyland 110, and finishes with ¾-mile at 1 in 432 from beyond the Leyland 110 to Euxton Junction. After a level stretch from

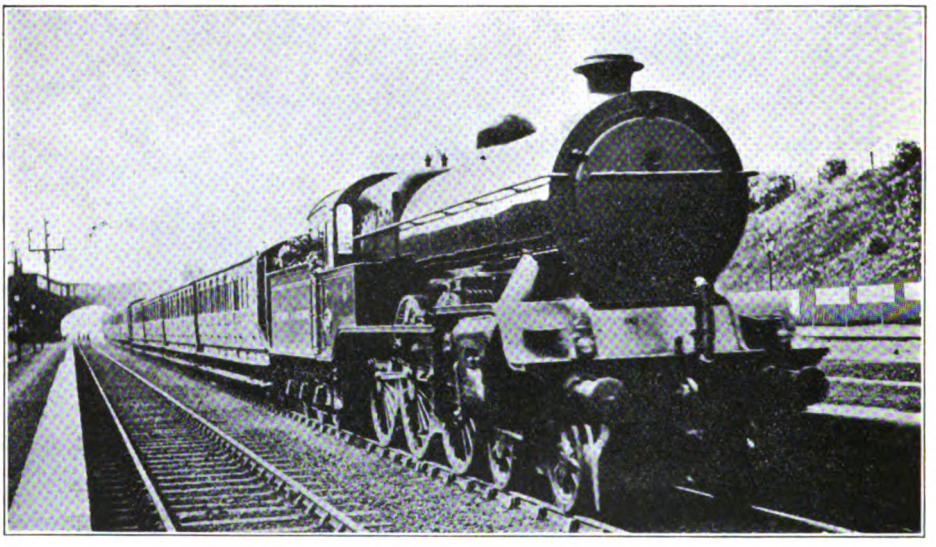

Photo.] LONDON & NORTH WESTERN RAILWAY. [*Henry L. Salmon.*

Liverpool-Hull Continental express. New four-cylinder superheater 4–6–0 engine No. 1650.

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Euxton to Balshaw Lane, Coppull bank then begins as mentioned, and finishes with 1½ miles at 1 in 245-107 (¼-mile)—636 to the summit. Yet on the test trip we Standish to Warrington, and from there, though good, the work was not exceptional to Crewe, where we arrived almost exactly to time, despite the Winsford

L. AND N.W.R.: CARLISLE–CREWE.

Distance.	Engine No.: Engine: Name: Engine: Type: Load (tons, tare): Load (tons, full)	Schedule.	PRE-WAR. 1725 *John Bateson* *4-4-0 352 375	PRE-WAR. 1388 *Andromeda* †4-6-0 354 375	Schedule.	POST-WAR. 1657 — ¶4-6-0 403 415	POST-WAR. 251 — †4-6-0 238 250
Miles.		Min.	m. s.	m. s.	min.	m. s.	m. s.
0.0	Carlisle	0	0 00	0 00	0	0 00	0 00 Sigs.
4.9	Wreay	—	10 05	10 25	—	9 30	12 00
7.4	Southwaite ..	—	14 05	14 25	—	13 00	15 20
10.7	Calthwaite	—	19 20	19 05	—	17 20	19 25
13.1	Plumpton	—	22 55	22 25	—	20 20	—
17.9	Penrith	27	28 25	28 25	27	25 50	27 15
22.1	Clifton	—	33 15	33 00	—	30 45	31 20
29.4	Shap	—	45 20	44 00	—	42 40	41 25
31.4	Summit	50	48 35	47 05	50	45 35	44 10 Sigs.
36.9	Tebay	57	54 00	52 40	56	51 35	52 55 Sigs.
49.9	Oxenholme ..	72	66 00	65 10	70	65 00 p.w.r.	67 45
62.8	Carnforth	86	77 35	76 55	83	79 30	79 10 Sigs.
69.0	Lancaster ..	93	83 50	83 10	90	86 25	87 25
73.4	Galgate	—	88 40	88 45	—	91 55	93 10
80.6	Garstang	—	95 30	97 05	—	99 30 p.w. stop	99 55
85.3	Barton	—	99 55	102 40	—	108 55	104 00
90.0	Preston	116§ Note (A)	105 45§ Note (A)	109 10§ Note (A)	115	115 40	110 10
2.3	Farington	—	3 45	4 05	—	4 30	—
4.0	Leyland	—	6 10	6 40	—	6 40	—
6.7	Balshaw Lane ..	—	9 45	10 20	—	8 30	—
9.3	Coppull	—	13 00	13 40	—	12 45	—
11.8	Standish Junction	15	16 10	16 50	15	15 45	—
15.1	Wigan	19	19 30	20 10	19	18 55	—
20.0	Golborne	—	24 30	25 10	—	24 05	—
26.9	Warrington ..	32	31 35	31 55	32	31 30	—
29.7	Moore	—	35 30	35 55	—	35 00	—
34.8	Weaver Junction ..	41	41 10	41 45	41	40 15	—
42.2	Winsford Junction	49	48 45	51 0	49	47 45 p.w.r.	—
46.1	Minshull Vernon ..	—	52 40 Sig. stop	56 10	—	53 45	—
51.0	Crewe	59	60 45	63 35	60	60 10	—

(A) Times from *passing* Preston. * "George the Fifth" class. † "Prince of Wales" class. ¶ L. and Y. superheated four-cylinder class. § Passing time.

passed Farington at 44, Leyland at 48½ Euxton at 53, Balshaw Lane at 60(!), and Coppull Summit at 45½ m.p.h.—an extraordinary achievement with such a train. Very restrained running followed from check; net time from Preston was 58 min. Despite *Andromeda's* leisurely work, her total from Carlisle was still only 172¾ min., or 2¼ min. inside time; *John Bateson*, on the other hand, finished magnificently all

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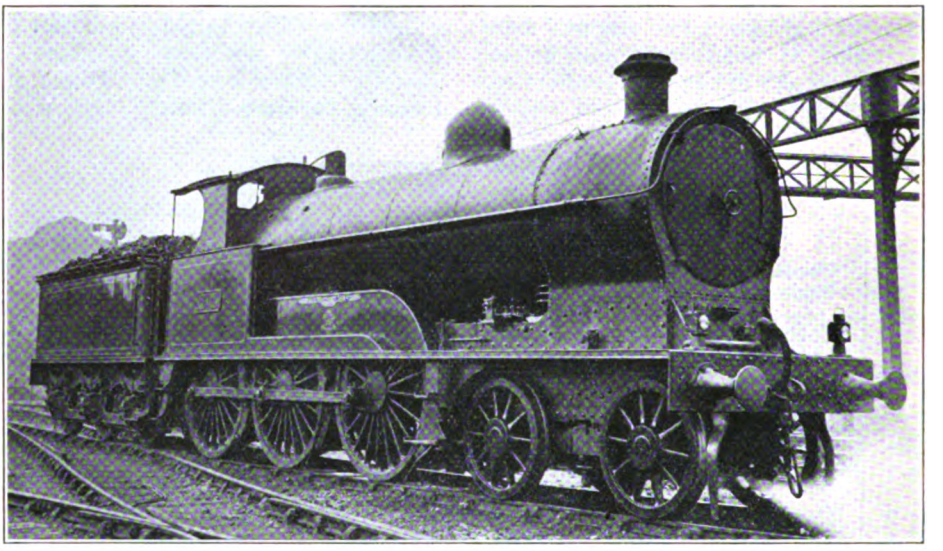

Photo.] LONDON & NORTH WESTERN RAILWAY. [*P. F. Cooke.*

4-6-0 Superheater locomotive No. 819. "Prince of Wales."

the way from Preston, and actually stopped at Crewe home signals in 164 min. 5 sec. from Carlisle, booked time to the station being 175 min., and this with a 54-axle train of 375 tons' total weight. One of the finest features of this trip was the maximum of 69 m.p.h. on a very little easier than level track at Brock, between Garstang and Barton.

I have not yet mentioned the exploits of 4-6-0 *Prince* No. 251, on the same train as the test run, with an ordinary load, but hasten to do so in conclusion. It was with a formation of six 8-wheelers, a "diner" and a 12-wheeled brake third, or 36 axles. We were all but stopped by signals at Upperby Bridge, but then went ahead in tremendous style, reaching

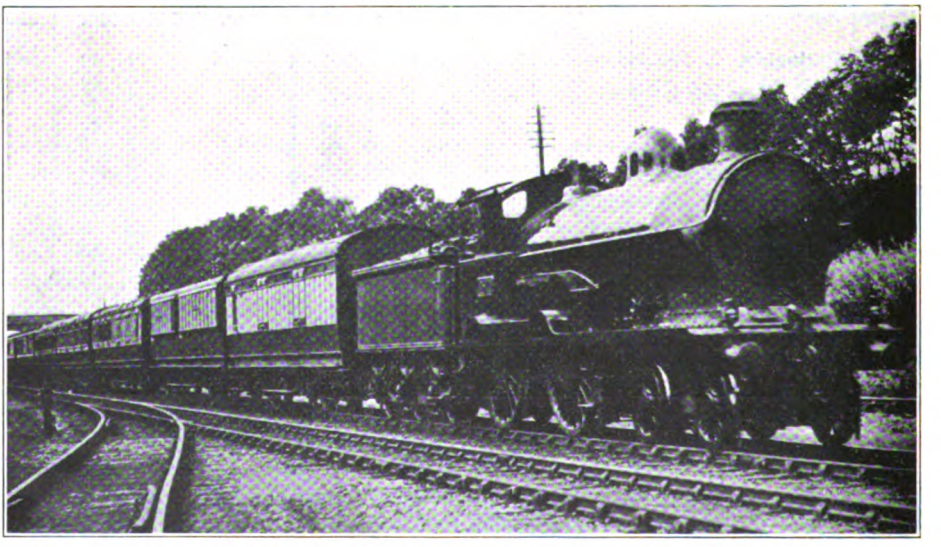

Photo.] LONDON & NORTH WESTERN RAILWAY. [*Henry L. Salmon.*

Up Irish Mail Express near Shilton. 4-4-0 superheater engine No. 2370, "Dovedale," "George the Fifth" type.

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50 m.p.h. beyond Southwaite, only falling to 48½ m.p.h. beyond Plumpton, and actually getting up to 67 through Penrith—a rate which I never recollect previously having paralleled here in this direction of running. Then followed a sustained rate of 38 m.p.h. up the 1 in 125, so that we beat 1657's time to Summit by 85 sec., and incidentally had bettered schedule by all but 6 min. despite the initial check costing fully 2½ to 3 min.! Bad signal and p.w.r. checks beset us from Summit down to Oxenholme, but we made good time thence to Carnforth, running at 71½-72½ m.p.h. all the way but for a brief drop to 59 over Burton "hump"; another cruel check preceded the approach to Lancaster. Once up the 1 in 98 from Lancaster to Lancaster Junction, we went better than ever, working up gradually on the very slightly falling grades to a top speed of 71½ m.p.h. at Brock; in fact, we ran the 14 miles from Bay Horse to Oxheys Box in 12 min. 55 sec. So we ran into Preston all but 5 min. early, despite this succession of checks! Taking *John Bateson's* times from Summit to Oxenholme and Carnforth to Galgate, in order to arrive at the net time, and allowing 3 min. for the check just after starting—not unfair by comparison of the running—we come down to a net time of 98 min. for the 90 miles from Carlisle to Preston, or *seventeen minutes* inside schedule. I could have wished that Lord Monkswell had been my companion on these journeys; it might have modified his well-known views as to making up lost time in this country!

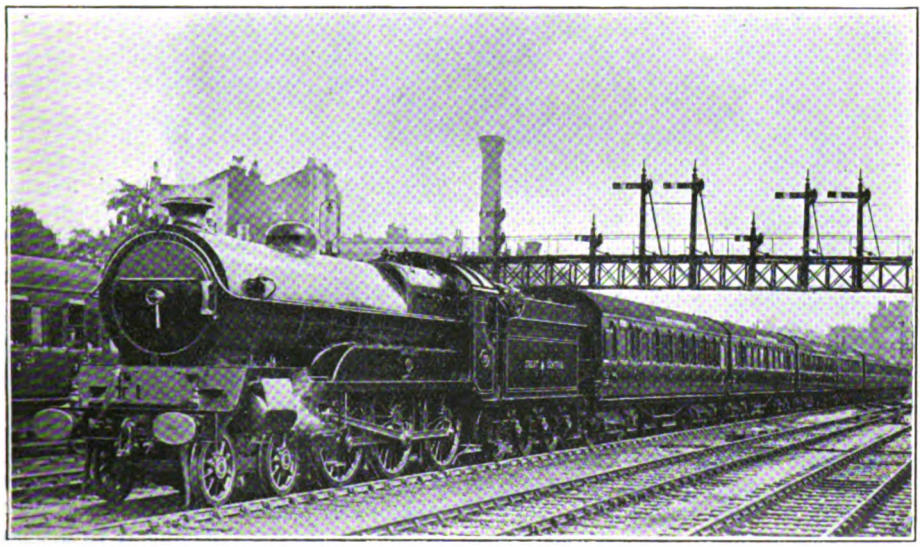

Photo.] **GREAT CENTRAL RAILWAY.** [*F. E. Mackay.*

Down Manchester Restaurant Car Express leaving Marylebone Station.
Four-cylinder 4-6-0 locomotive, "Earl Haig."

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Locomotive and Train Working in the latter part of the 19th Century.

BRECON AND MERTHYR RAILWAY.—[No. II.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

REFERENCE was made last month to four 2-4-0 side tank engines of Great Western type ordered from Messrs. R. Stephenson & Company. These were delivered at the end of 1888 and beginning of 1889, and were of very similar dimensions to their Great Western prototypes with 16 in. by 24 in. cylinders, 5 ft. 1 in. coupled wheels with inside bearings, and 3 ft. 7 in leading wheels having outside bearings; in fact they looked as if they had been built from similar drawings The cabs were similar and were not extended to protect the men at the back They were numbered 9 to 12, and one or two of them were stationed at Brecon to replace six-coupled engines on the service between Brecon and Merthyr, these trains being generally very light.

The main line passenger train service between Newport and Brecon consisted of three through trains in each direction, which were worked by the six-coupled saddle-tank engines Nos. 11 (later 18) and 17. The working was somewhat peculiar. One of two engines was stabled at Newport (High Street) and on Mondays, Wednesdays and Fridays, left Newport at 7.50 a.m. reaching Brecon at 10.55 a.m. The return journey was started at 2.5 p.m. with a double-headed train to be mentioned subsequently, which arrived at Newport at about 4.50 p.m. The same engine then left Newport for Brecon at 5.40 p.m. arriving at Brecon at 8.30 p.m. where the Newport engine and men put up for the night.

The Brecon engine left Brecon on its first trip at 9.40 a.m. and reached Newport at 11.32 a.m. It returned at 12.40 p.m., arriving at Brecon at 3.25 p.m.

From Brecon it again departed for Newport at 4.50 p.m. and reached the latter place at 7.55 p.m. where the Brecon engine and men stabled for the night. On Tuesdays, Thursdays and Saturdays the working was reversed, the Brecon engine working the same trains as the Newport engine had worked on the preceding days, and *vice versa*.

In addition there was a service of four trains between Brecon and Merthyr. Of these two were connections made at Pontsticill Junction with the Brecon and Newport main line trains, and were usually worked by a Merthyr engine, which ran to Pontsticill and back. The 11.30 a.m. from Brecon was a through train to Merthyr and was worked by a Brecon engine which, I believe, worked a goods train back. The through train from Merthyr to Brecon at 12.20 p.m. was worked by a Merthyr engine.

But the main line train which left Brecon for Newport at 2.5 p.m. was a double train drawn by two engines, one being the through main line engine and the other a Brecon engine which ran through to Merthyr. This train, which usually consisted of nine or ten four-wheeled carriages, was divided at Pontsticill, one portion going to Merthyr with one of the engines and the other to Newport. My own journeys over the line were made with this train, of which I shall have something to say subsequently.

Although the Brecon and Newport engines and men lodged out on alternate nights, the guards changed trains on the first morning trip each day at Bargoed, and were thus enabled to get home each night.

The goods trains over the northern section up the Talybont bank were mostly double-headed. The Talyllyn "day goods" which left Talyllyn at 5.45 a.m. was drawn by two Talyllyn engines, and the Talyllyn 6.40 p.m. "night goods" was worked by one Talyllyn and one Brecon engine. There was one single-headed Brecon day goods which worked to Pontsticill and then returned to Talyllyn for a second load. In nearly all cases the goods trains over this section were worked by Talyllyn engines, and the Brecon traffic

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was worked to and from Talyllyn by the Brecon shunting engine, which made three trips each way per day.

On the southern section the trains consisted principally of mineral traffic from Dowlais, Rhymney and the various collieries, to Newport, with the corresponding returning empties. There was one through goods train each way between Newport and Pontsticill Junction, where interchange of traffic between the southern and northern sections took place, but, as far as I can gather, the southern division goods engines stationed at Machen did not usually run beyond Pontsticill over the road to Brecon.

Accidents on the line have been very rare in spite of the difficulties in working a long single line with such terrific gradients. In former years there were a few awkward cases of trains breaking loose, one of them serious. An extraordinary case occurred in November, 1867.* A passenger train from Cefn, on the Merthyr branch, to Brecon, had just left Dolygaer on the main line, when it was met by some runaway wagons which had broken loose near Torpantau and came down the hill full tilt. The first wagon contained rails, which, when the collision occurred, were propelled through the end of the truck and smashed in the smokebox door of the passenger train engine, forcing a number of the boiler tubes out of the barrel, through the firebox and across the footplate into the tender. The driver, who saw the wagons coming, lay down on the footplate and escaped with some bad cuts and scalds, and the fireman jumped off. Although there were about 30 passengers in the train it is marvellous that no one was killed.

A more serious runaway occurred on the long seven mile descent between Torpantau and Talybont in December, 1878. At that time the maximum permissible loads were not regulated as they are now, and a heavy train consisting of 36 wagons, of which 25 were loaded, and a brake van was descending the bank under the charge of three 0-6-0 saddle tank engines, two of which were in front, and one at the rear, when the train got out of control and toboganned down in the direction of Talybont. When near the latter station it left the road and the whole train was completely wrecked, both drivers and firemen on the leading engines being killed. The loads on this bank are now limited to eight loaded 10-ton and twenty empty wagons although much

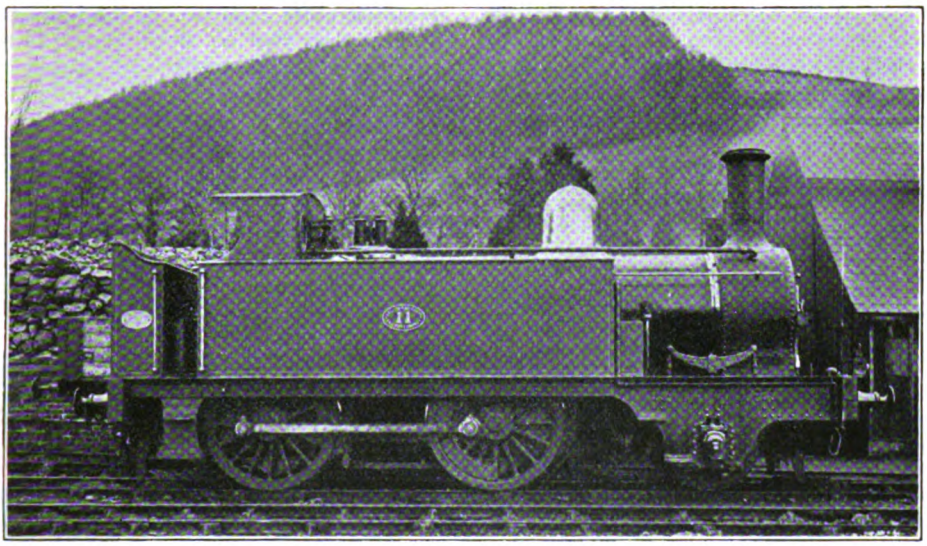

Photo.] [*Loco. Publishing Co. Ltd.*

2-4-0 SIDE TANK PASSENGER ENGINE NO. 11 (G.W.R. TYPE).

Built by R. Stephenson & Co., 1889. Coupled wheels, 5 ft. 1 in. diam. Cylinders, 16 in. by 24 in.

* For the account of this I am indebted to the pages of the *Locomotive Magazine*.

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more powerful engines with increased brake power are available.

The Talybont bank will always remain associated in my mind with an incident, in which I was a forced but unwilling participant. This occurred more than 30 years ago, and may be described as a compound of some ultra-ardent Welsh "revivalists" and a defective locomotive valve. I was unfortunate enough to get into the mixture simply because the revivalists would insist on operating on me, and I could not get out of it.

It was a beautiful Saturday in the spring when I left Talyllin Junction on my way to Merthyr in the 2.5 p.m. train from Brecon, which consisted of nine or ten small four-wheeled coaches drawn by two engines. Having found an empty smoking compartment, I lighted my pipe, and settled myself to enjoy the beautiful scenery. When we arrived at Talybont there were a good many people on the platform, some of whom appeared to be in the throes of a psychic commotion. The carriage door was suddenly flung open and an individual in a long black coat and wide-awake hat hurriedly propelled himself across the compartment, landed on my toes, and finally sat down violently in the corner seat opposite to me. He was followed by six similar apparitions, who also bundled in amidst what appeared to be approving valedictory murmurs from the platform. It was not until the train moved out and started to climb the incline that I found time to take stock of my new companions. They were all dressed in a sort of ministerial garb, but there was nevertheless something indefinable about them which gave room for doubt, so that I finally put them down as an assorted lot of nondescript deacons. The first comer who sat opposite to me had piercing dark eyes and a very severe cast of countenance. His appearance was emphasized in that he had obviously breakfasted to the accompaniment of considerable coffee, for much of the latter had "jumped the points," left its proper road, and landed on an expansive but none too clean shirt front, on which it had trickled down in two streams of a deep brown hue at the top, gradually mellowing into a Liberty-art-shade, yellow at the bottom, where they disappeared from view beneath a low-cut black waistcoat. The rest of the company, apart from their semi-clerical attire, presented no special features that merited notice, so I turned my attention to the magnificent view of the mountains, whilst listening to the hard beats of the engines, as they toiled laboriously up the 1 in 38 incline.

I was conscious that the possessor of the coffee stains was regarding me with a fixed stare, and presently, without further warning, came the abrupt question, obviously addressed to me, "Are you saved?" There are, I should think, very few people who care to discuss such a subject with chance fellow-travellers, and therefore I silently tried to conceal my annoyance by devoting more attention to the mountains. A pause of two or three uncomfortable minutes followed, until I felt a hand laid on my knee, and again came the question "Young man, have you thought of your salvation?" The eyes of the whole lot were on me, and I felt myself getting very red in the face. The situation was becoming desperate, but something had to be done to relieve it, and I therefore blurted out mildly that I would prefer not to discuss the subject. "Why not?" said my tormentor. To this I failed for an answer, and not knowing what else to do, proceeded to re-light my pipe and gaze steadily out of the window. A long and oppressive silence followed, and then . . . "Young man, I am going to pray for you," followed by a murmur of approval from one or two of the other members of the company. Prayer on my behalf by the coffee-striped gentleman was forthwith started, in Welsh, which I did not understand. It was somewhat lengthy, but presently I detected the sound of a change in the heavy beat of one of the engines. Instead of the rhythmic "four in a bar" there developed a syncopated three beats and a blow. "Sounds like a broken lap" was my mental comment, referring of course to the engine and not to the revivalist, who was still "going strong." As we had not arrived at Torpantau tunnel, I began to wonder whether we should manage to reach the top of the bank, and an uncomfortable speculation obtruded itself on my mind as to whether any bits of valve were going to damage the cylinder. But as the train kept moving, though at a somewhat slower speed, I tried to comfort myself with the knowledge that fortunately there were two engines, and I

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gradually began to feel more at ease. Prayer ended as we were close to the Torpantau tunnel, and then I saw my chance of switching off that subject, by remarking genially that I could hear something amiss with the engine, and that things looked very much as if we might not get up the hill. "I hope nothing is wrong," said one of the others, "we have a meeting in Dowlais this afternoon," My friend with the shirt-front fidgetted about very uneasily as I carefully drew their attention to the three beats and the "blow," with special emphasis on the latter, which was unmistakably apparent in the tunnel.

"I wonder if it is serious," he remarked at last somewhat anxiously. "Well," I replied, "the train looks somewhat like sticking in the tunnel," and then I added:—"The worst is that if the brakes do not hold, there is a possibility of the whole lot of us going down the hill again a good deal faster than I care to think about." The anxiety on my behalf seemed to be waning rapidly, and the gentleman who had shown so much solicitude for my future welfare was obviously ill at ease. Now that it had come to the point that there was even a bare suggestion of his having to leave this bad and sinful world for a better one, he did not appear to be in any very great hurry to quit.

But I acknowledge that I felt thankful on getting safely through to Torpantau at a crawl thanks to the pilot engine, and I was also relieved to see that "revival" operations on myself were evidently voted "off" for the time being, pending developments. It is within the bounds of possibility that we might have failed to get up, but for the fact that the gradient on entering the tunnel lessens to 1 in 68, though I did not know that at the time.

After a consultation between the drivers, they decided to proceed, and we went down the opposite slope very cautiously to Pontsticill Junction, where we arrived about half-an-hour late, and arrangements were made for another engine, which happened to be there, to take the train on. At Pontsticill, to my great relief, a porter bundled my cheerful companions out of the carriage into the other part of the train, in which, to get to Pant for Dowlais, they ought to have been from the first.

In 1894 two 0-6-2 mineral saddle-tank engines were placed in service, and were the first engines on the line to have more than six wheels. These were designed and built by the the Vulcan Foundry and had

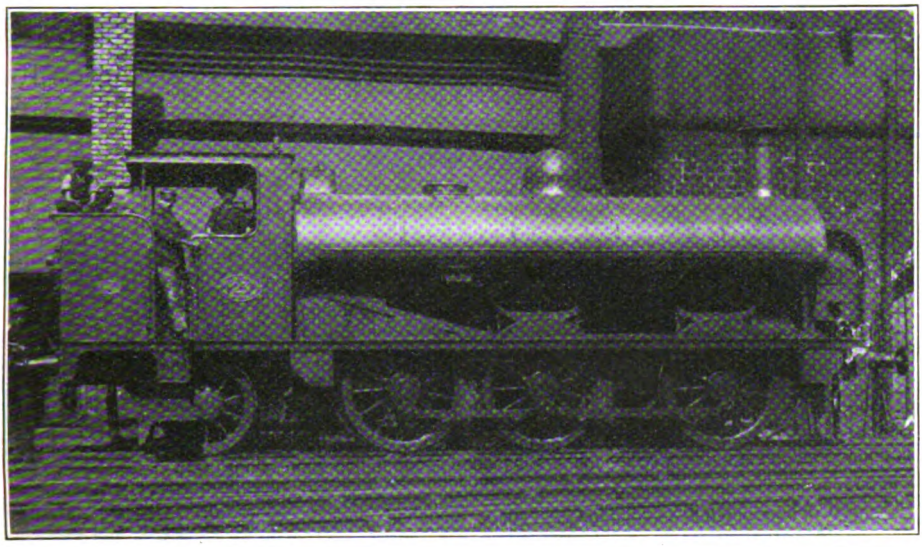

Photo.] [*Loco. Publishing Co. Ltd.*

0-6-2 SADDLE TANK ENGINE NO. 23.

Built by Vulcan Foundry Ltd., 1894. Coupled wheels, 4 ft., 7 in. diam. Cylinders, 17 in. by 24 in.

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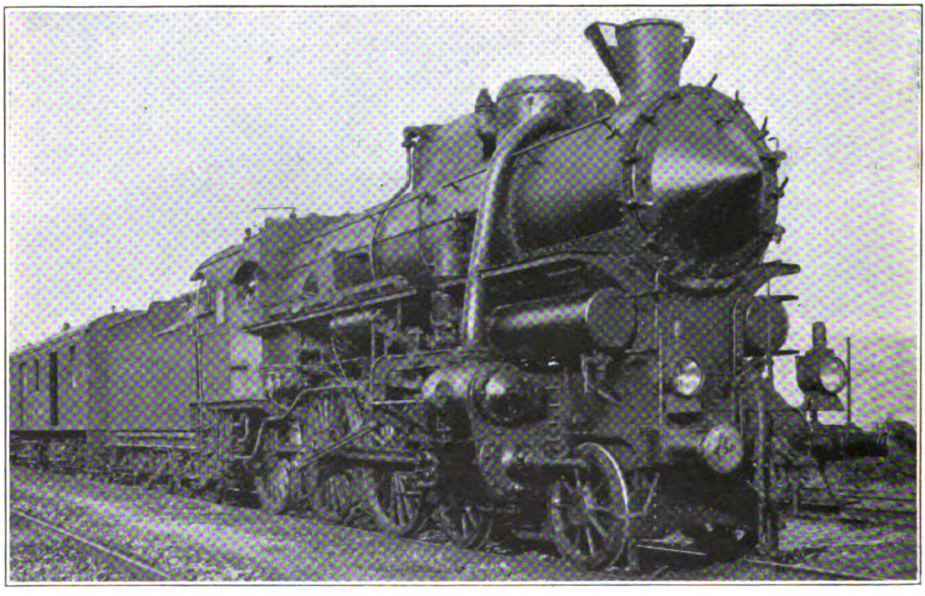
inside frames throughout and radial trailing wheels. The cylinders are 17 in. by 24 in., the coupled wheels have a diameter of 4 ft. 7½ in. and the boilers carry 150 lb. pressure. Tank capacity, 1,100 gallons. In 1897–8 three more engines were added to the stock, of which one No. 25 was a 2-4-0 passenger tank engine by Stephenson and Company in 1898, similar to Nos. 9 to 12. The other two engines Nos. 22 and 24 were built by Kitson and Company in 1897, and in these a return was made to the 0-6-0 type of saddle-tank engine with double frames and outside cranks, very similar to the type of engine taken over from the Neath and Brecon Railway. The cylinders are 17 in. by 24 in. as in the previous engines of this type, but the coupled wheels are increased in size to 4 ft. 7½ in. and the boiler pressure raised to 160 lb. per sq. in. Three similar engines, Nos. 27, 28 and 29 were built in 1900 by Nasmyth, Wilson Company, Limited, of Patricroft near Manchester. The saddle-tanks of all these later engines have a capacity of 1,100 gallons, and extend to the front of the smokebox. The total number of engines at the end of the century was 31, of which six were four-coupled tank engines, exclusively used for passenger traffic.

"A THING OF BEAUTY——"!



AN EXPRESS TRAIN ON THE HUNGARIAN STATE RAILWAYS.
Drawn by a recent 4–6–0 locomotive "of striking appearance."

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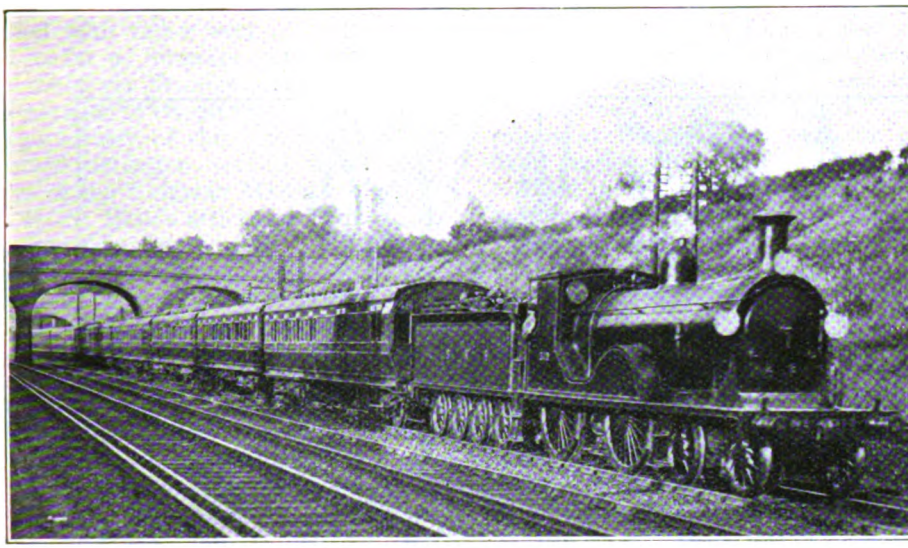

Photo. by] 6.30 P.M. BOURNEMOUTH RESTAURANT CAR EXPRESS. [*F. E. Mackay.*
4-4-0 Locomotive No. 313.

The London and South Western Railway in South Hants and South Dorset.

By "INDICATOR."

IT is only to be expected that those sections of the London and South Western Railway which are concerned in journeys and traffic to and from the larger towns and pleasure resorts of the south coast should receive principal attention, not only from the point of view of the railwayist, especially if he is interested mainly in express train working and locomotive performance, but also by the tourist and holiday maker who bases his ideas of a pleasurable and healthful vacation upon the attractions (scenic and otherwise) and conditions of places in chief public favour and having great reputations. Therefore, it is not surprising that to a large proportion of the readers of the RAILWAY MAGAZINE, and to a still greater extent the general public, the main routes only are principally known, and even in their case little attention is paid to the numerous places of scenic and tourist interest served by the intermediate stations passed *en route* and generally at high speed. It is true that the traveller will pass remarks about the picturesque scenery of districts traversed, especially those sections of the London and South Western Railway which cross the New Forest, and most passengers are interested as they cross a part of Holes Bay between Poole station and Hamworthy Junction. Beyond this, however, if special thought is given to these places at all, it is that they can be visited during a holiday by road or water, or by taking advantage of the numerous local excursion facilities once again granted on so liberal a scale.

For many reasons, however, the sections of the London and South Western Railway which serve South Hampshire and South Dorset possess great interest, including both the intermediate stations on the present-day main routes and the branches and alternative routes. To a great extent these remarks apply equally to the somewhat complex system of lines radiating from Eastleigh in the Portsmouth direc-

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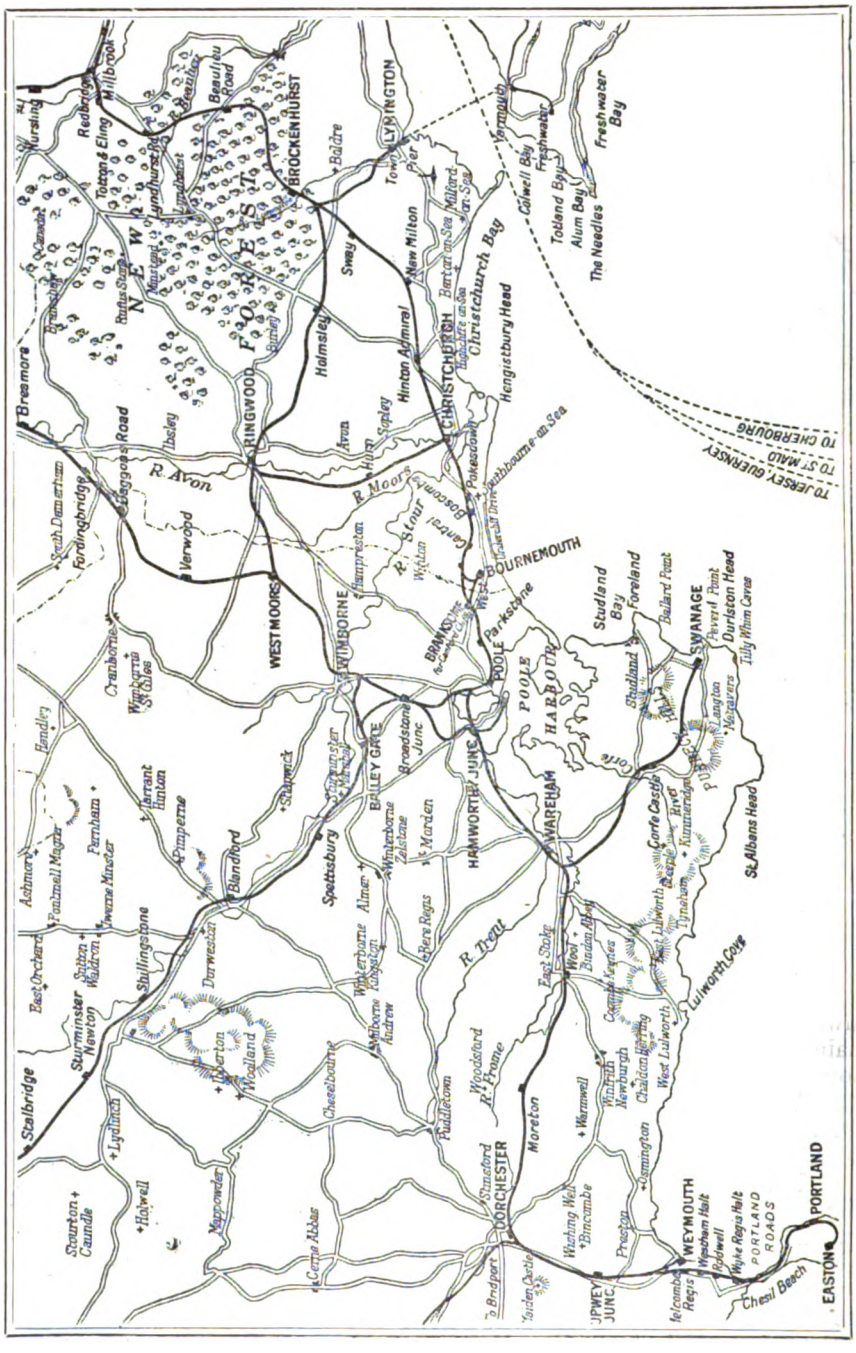

LONDON & SOUTH WESTERN RAILWAY LINES IN SOUTH HANTS AND SOUTH DORSET.

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tion, but this article is principally concerned with those west of Southampton and as far as Swanage, and especially to the route via Wimborne and Ringwood, and sections in connection.

The history of this group of lines has received attention several times in the pages of the RAILWAY MAGAZINE, notably Mr. H. H. Meik's article on "Railways of the Bournemouth District," published in the June, 1910, issue. This aspect may, therefore, be reviewed very briefly.

First, it is of interest to note that the original main line did not serve Bournemouth directly at all. Based upon a scheme known as "Castleman's Snake," initiated by a Wimborne solicitor named Castleman, it was opened from the London and Southampton line at Northam, via Redbridge, Brockenhurst, Ringwood, Poole Junction (now Broadstone Junction), Hamworthy Junction, and Wareham to Dorchester, on June 1, 1847. There was also a branch from Hamworthy Junction to Hamworthy, giving access by bridge or ferry to Poole, on the other side of the Harbour. This section has long been closed for passenger trains, but is used for goods traffic, the remains of the old station being still in existence as goods depôt premises.

Hamworthy (then known as Poole) was thus the station for Bournemouth (as well as Poole) for a number of years, but in 1859 a Bill for a line from Ringwood to Christchurch received Royal Assent, and was opened November 13, 1862, giving Bournemouth a station only 4½ miles distant. This line was extended to Bournemouth on March 14, 1870. There were then no intermediate stations on this extension, Pokesdown and Boscombe being opened on July 1, 1886, and the Bournemouth terminus was the present goods station on Holderness Road, adjacent to Bournemouth (Central) station. The original line from Southampton to Dorchester was taken over by the London and South Western Railway Company in 1848, and was doubled in 1863. The Ringwood, Christchurch and Bournemouth Railway was amalgamated with the London and South Western Railway on January 1, 1874.

In 1866 a line was authorised from Poole Junction (now Broadstone Junction) to Poole, and opened December 2, 1874, and on June 15 of the same year a single line was opened from Poole to Bournemouth, with one intermediate station at Parkstone. This was doubled in 1886, and in 1893 Branksome station was opened. The terminus at Bournemouth was the present West station.

Even as thus completed, the railway system of the district was by no means of the most useful character, and so several connecting lines were added; from the Somerset and Dorset Joint Railway at Corfe Mullen Junction direct to Broadstone Junction, avoiding the necessity for running into Wimborne and reversing, opened April 26, 1886; from Brockenhurst to Christchurch via Sway, March 6, 1888; from Bournemouth original station into the present Central station, long known as Bournemouth (East), opened July 20, 1885; from Bournemouth (East) to Bournemouth West Junction, and from Gasworks Junction to Branksome, opened March 6, 1888; and the Holes Bay curve from Poole to Hamworthy Junction direct, opened in 1893, shortly after which date the Hamworthy branch was closed for passenger traffic.

It will therefore be seen that even in regard to the places now considered as of principal importance, the situation was very different in earlier years. Indeed, roadside towns such as Ringwood and Wimborne then were mainly considered, and it was a far more important matter to serve Poole, with its shipping activities, than Bournemouth—little more than a small coast hamlet—or even other places of less modern growth as holiday resorts.

Bournemouth, Weymouth and other places which have come into special favour for holiday purposes now account for a large proportion of the total traffic of these lines, and very few, if any, of the principal trains of to-day take the old route at all. But most of the intermediate stations still possess considerable local importance, and, in many cases, provide not only historic and tourist interest, but also constitute in themselves holiday centres whose attractions are not so well known as they should be.

Southampton itself has claims to be regarded as a holiday resort, and as the railway skirts the fringe of Southampton Water pretty views can be had, especially when the tide is up, as Redbridge and Mill-

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brook stations are passed, there being, for part of the way, a public promenade between the railway and the shore.

Lyndhurst Road, Beaulieu Road, and Brockenhurst may be regarded as equally important as centres for tours in the New Forest area. The small town of Lyndhurst, "the capital of the Forest," three miles from Lyndhurst Road station, is perhaps the best centre for touring the forest, and for walks and drives in the vicinity, but Brockenhurst is almost equally convenient and more so for visiting a wider area. The latter station is also served by many of the principal expresses, on the Salisbury-Ringwood line, and Hinton Admiral between Brockenhurst and Christchurch.

Brockenhurst is also the junction for Lymington, whence London and South Western steamer services to Yarmouth, Totland Bay, Alum Bay, and Isle of Wight, are available. A special feature of this route is that a ferry system is in operation for conveying motor cars, &c., to and from the Island. Lymington itself is a good holiday centre, giving access by rail and water to many places of interest, and being also connected by a motor 'bus service with Milford-on-Sea, reached also from New

Photo. by] [*J. C. Searls.*

LONDON-BOURNEMOUTH EXPRESS ENTERING BOURNEMOUTH WEST STATION.

Rebuilt and superheated 4-4-0 locomotive, 420 class.

and this avoids a change of trains. The town of Beaulieu, reached from Beaulieu Road station, is a lovely spot, picturesquely situated on a tidal river. The whole of this district has much historical, archæological and antiquarian interest, while the views of the forest, with its long series of avenues, albeit at present seriously denuded of timber adjacent to the railway (owing to the tree-felling done during the war), as seen from the train, afford abundant indications of the attractions offered to the tourist who explores its recesses. Other stations on the fringe of the forest are Downton, Breamore and Fordingbridge, Milton station on the main line from Brockenhurst to Bournemouth.

In regard to the latter section, it will be sufficient to mention New Milton, for Milford-on-Sea and Barton-on-Sea, Hinton Admiral, for Highcliffe-on-Sea, and Pokesdown, for Southbourne-on-Sea, rising coast resorts on a smaller scale, and which, as they become better known, will no doubt attract many visitors who desire picturesque scenery, good sands and bathing, and not too many of the "attractions" which figure so prominently at the great popular resorts. The ancient town of Christchurch is also a splendid centre.

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On the old main line Ringwood is the principal station in Hampshire. This is a country town of considerable beauty, situated on the River Avon, a favourite with fishermen. The branch from Ringwood to Christchurch has only one intermediate station, Hurn, but there is a private station at Avon Lodge, where trains call as required.

There is not a great deal of special railway interest in regard to these stations. Brockenhurst has bays on each side so that the Lymington branch trains can be placed conveniently for transfer of passengers and luggage in each direction. Ringwood also has terminal accommodation, but as the trains via Hurn usually run between Bournemouth and Ringwood, there is no need for such provision at Christchurch, though the present station, together with those at Pokesdown (island type) and Boscombe, are good examples of station architecture and equipment.

Bournemouth itself is in Hampshire, but the county boundary is only a short distance west of the West station. Branksome and all stations west thereof, also west of Ringwood on that route, are therefore in Dorset. For holiday purposes Branksome may almost be said to be part of Bournemouth, while Parkstone has gained a repute of its own, both as a health resort and for residential purposes. It is convenient for boating and fishing on Poole Harbour, and, together with Poole itself, gives access to many places of interest across the harbour and on the islands which render this splendid stretch of water so interesting and attractive. Poole itself is a picturesque old town, with many historic associations. It has a fine park with a wide stretch of water for those who prefer the quiet of an "inland" lake, though the "sea" of Poole Harbour can hardly be described as "restless," so well protected is it. Cranford Cliffs, Hartland Cliffs and Lulworth Cove and other places are also accessible by motor 'bus and ferry services from Poole as well as from Bournemouth. Hamworthy, too, is an attractive place in some respects, while stations to Wareham all give access to places of holiday and tourist interest.

Besides the interest of the railways of this section from the tourist and holiday point of view, there is much that will appeal to the railwayist, and a few remarks on this aspect will therefore be in place. It has to be remembered that most of the principal trains from London are in two sections, divided at Bournemouth Central station. Most of the Bournemouth West sections are now vestibuled throughout, and, if not provided with a restaurant car, are made up of the new green-painted stock in which a pantry for serving light refreshments is included. Some of the restaurant cars and the vehicles which run with them are also now in the new standard green livery. On some trains, the Bournemouth West portion is in front, and, after arrival at Bournemouth Central station, that section goes on first, drawn by the London engine, travelling via the connecting curve near Branksome station, and almost reversing direction to run into Bournemouth West station. When that portion has gone, another engine backs on to the Weymouth or Swanage portion. In other cases the London engine is detached at Bournemouth Central station, another locomotive taking on the Weymouth or Swanage portion in front, and after it has gone the former engine comes back on to the Bournemouth West portion and completes its journey therewith. At present, the Weymouth or Swanage portions, though vestibuled with the main train for access to the restaurant or pantry car during the journey from London, do not provide such accommodation west of Bournemouth, but it is intended to provide Weymouth sets duplicating the Bournemouth West "light refreshment" sets.

In the up direction the Weymouth or Swanage portion usually comes into Bournemouth Central station first, stopping at the platform and the engine being detached. A few minutes later the Bournemouth West section, with the locomotive for London, runs through the station on the middle line and then backs on to the front of the Weymouth or Swanage portion. In many instances, especially if a Weymouth portion is semi-fast, there is a slow train in advance, and this usually runs through Bournemouth Central station and backs into the bay on the Up side, after which it may follow the express to Southampton or Eastleigh as a stopping train, changing engines or not according to the necessities of working. On the down side, also, there is a bay from which a stopping train sometimes follows

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a Weymouth fast, but such trains, if arriving from Southampton or Eastleigh, unload at the main platform before shunting to the bay. In fact the centre road in the station on the down side is really a siding and not a running through line as on the up side, and is generally used to stable vehicles and for engines waiting to take on Weymouth and Swanage portions.

Leaving Bournemouth Central station the line is partly in cutting and then on embankment, while two sides of the Central-West-Branksome triangle are on high arched viaduct across the upper part of the Bourne valley, at the extreme end of the famous Bourne gardens. Near the junction are the Somerset and Dorset Joint Railway engine sheds. London and South Western locomotives are stabled alongside the Central station. Into Bournemouth West is a steep fall at 1 in 60, and this is often utilised to release engines of arriving trains, which push their empties out, are turned on to another line and away to shed, and the empties run back under brakesman's control into the station.

Between Parkstone and Poole the line skirts the lake in Poole Park, and also gives fine views of Poole Harbour. Poole station is on a sharp curve and is preceded by two level crossings within a few yards of one another. It is said that the Poole town authorities made it a condition that, as compensation for having two main roads thus hampered by the railway, all trains should be required to stop at the station. This is, at all events, the practice, including Somerset and Dorset as well as London and South Western trains.

Beyond Poole station—there is a harbour branch from the goods yard adjoining—at Holes Bay Junction the present main route curves away to cross Holes Bay by a low embankment, with viaduct portions here and there for waterways, continuing to Hamworthy Junction, serving the old line to Hamworthy goods station. The other branch from Holes Bay Junction curves round to follow the shores of the upper part of Holes Bay, and continues to Broadstone Junction. The original line ran, however, from Hamworthy Junction to Broadstone Junction, and although these come together some distance south of the latter station, they are on different levels, and it is only at the northern end of the platforms that connection is or can be made. Both sections are double track, and Broadstone Junction, with its four platforms, thus appears to be quite a busy station. At the north end the Somerset and Dorset line diverges to the left, and the London and South Western line to the right towards Wimborne. There is also, as already mentioned, a connecting line between Wimborne and the Somerset and Dorset Railway, completing another triangle, but this is principally used for goods traffic.

Beyond Hamworthy Junction the London and South Western Railway continues to Wareham, whence diverges the single line branch to Corfe Castle and Swanage, the main line continuing to Dorchester and thence to Weymouth by running powers over the Great Western Railway. The latter portion need not, however, be considered in detail in this article, interesting as it is. For the present, however, what has been said is sufficient to indicate that, in addition to serving districts where almost every station, intermediate or principal, gives access to places which are wonderfully picturesque, attractive to the tourist and sportsman, and often of great historical, archæological and antiquarian interest, these lines provide much which will appeal to the railway student. This applies both in regard to railway development and facilities and to the methods of train working and the locomotives used.

Thus, it is of interest to note that there is quite a busy suburban service between Bournemouth West and Poole, owing to the combination of trains for Weymouth and Swanage (these principally run direct to or from the Central station, but passengers can usually change into or from them conveniently, and in many cases they serve Branksome and Parkstone stations intermediately), between Bournemouth West and Wimborne, Ringwood or through to Salisbury, Somerset and Dorset Joint Railway trains, and a few Bournemouth-Ringwood locals which travel from the West station via Bournemouth Central and Christchurch. A number of these local trains can, indeed, make roundabout journeys, starting from and returning to Bournemouth. There are also a few trains from the Weymouth and Swanage line travelling from Hamworthy Junction to

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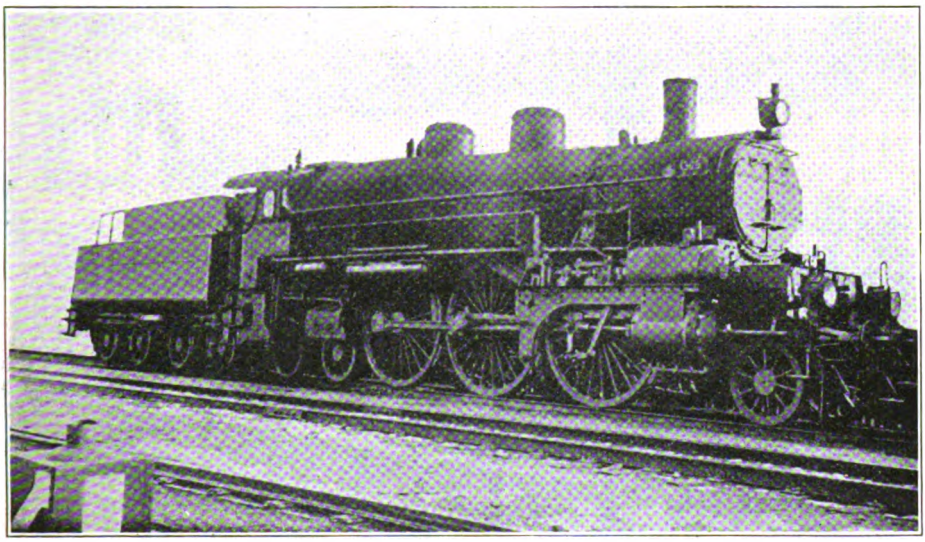
Broadstone Junction, and thence to Wimborne and through to Salisbury or to Southampton via Ringwood.

At present, Adams 4-4-2 and Drummond 0-4-4 tank engines are principally used for the Swanage trains and for many of the miscellaneous journeys operated in this district. Most of the trains to Weymouth, express or stopping, are worked by Adams 4-4-0 engines with 7 ft. coupled wheels west of Bournemouth, and these, with engines of other classes, are often to be seen on branch trains making composite journeys and eventually, though it may be in stages, working through to Salisbury, Southampton, Eastleigh or beyond. Many of the local trains are made up of standard three-coach bogie sets of vehicles, strengthened as required by one or more spare carriages.

AN UNUSUAL EUROPEAN LOCOMOTIVE TYPE.



2-6-4 FOUR-CYLINDER LOCOMOTIVE, PRUSSIAN STATE RAILWAYS.

Although the 2-6-4 wheel arrangement is a possible variation of the types usually employed for tender locomotives, we have not hitherto been aware of any such engines, except those based upon designs by the late K. Von Golsdorf, of which a considerable number were in use before the war in Austria and adjacent countries. Lieut. Jourdain, writing from Silesia, sends an illustration (reproduced above) showing a locomotive having this wheel arrangement, supplied to the Prussian State Railways in 1918 by the Floridsdorf Locomotive Works at Vienna. It is generally of the Austrian type, but has four cylinders, 15¾ in. diameter by 26¼ in. stroke, coupled wheels 7 ft. 1 in. diameter, and weighs without tender about 88 tons.

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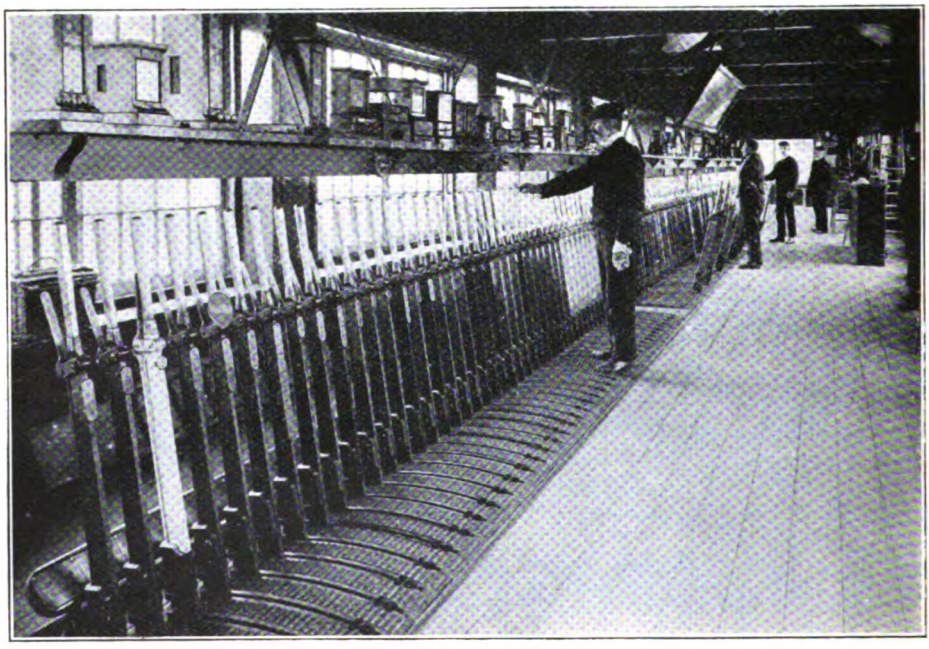
The Reading Signal Works of the Great Western Railway.

IN connection with the London Congress of the Institute of Transport of which an account was given last month, a visit was arranged to the Reading Signal Works of the Great Western Railway. The visit was attended by a large number of delegates who were greatly impressed with the comprehensive character of the works.



THE LARGEST MECHANICAL SIGNAL FRAME ON THE GREAT WESTERN RAILWAY.

By the courtesy of Mr. Felix J. C. Pole, General Manager, and Mr. A. T. Blackall, Signal and Telegraph Engineer, we are now enabled to illustrate and describe the principal features of the works.

These works were established about 1855 and at first were employed for the making of signals, cranes, girders, footbridges, permanent-way fittings and other equipment, and the repairing of engineering department wagons. In later years, however, all the operations, excepting those pertaining to signalling, were transferred to Swindon or elsewhere, the last to go being the permanent-way work in 1902.

In 1893 the maintenance of the signalling was transferred from the engineering to the signal department. This was followed in 1903 by the transfer to the signal department of the telegraph and telephone systems, necessitating additional shops being built for the manufacture and repair of electrical apparatus. The works now manufacture practically the whole of the materials used in the construction, and maintenance of the mechanical signalling and the telegraph and telephone installations on the Great Western Railway. A recent addition to the work is the maintenance and repair of the clocks throughout the line.

An idea of the amount of work devolving upon the department may be gained from the following particulars of the equipment in use at the present time:

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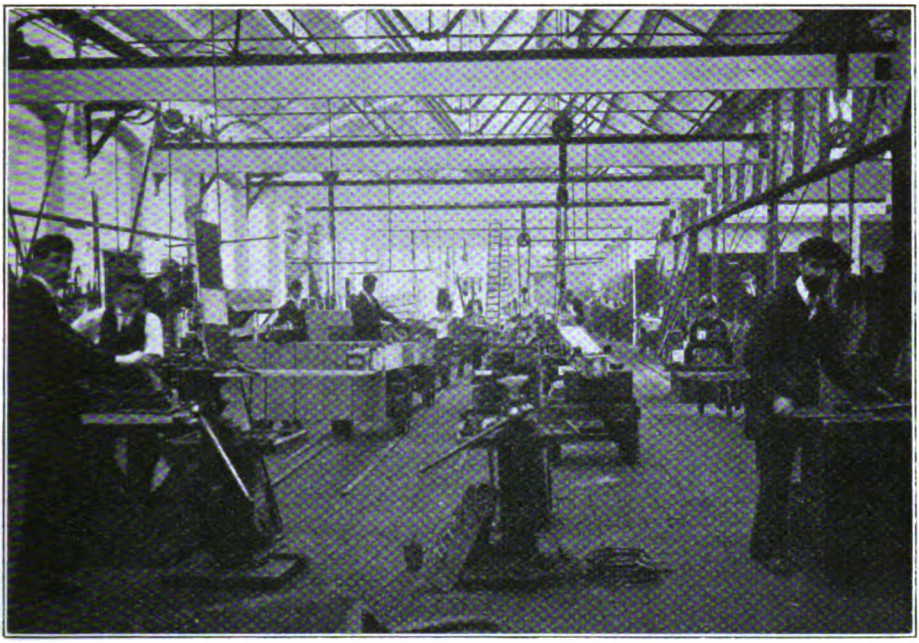
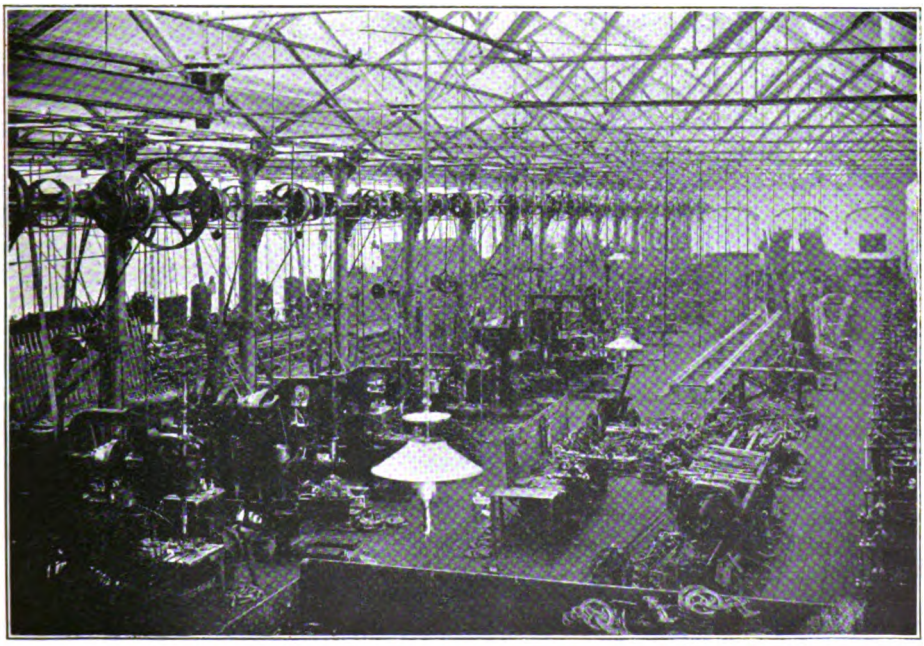


SIGNAL ERECTING SHOP.



LOCKING-GEAR SHOP.

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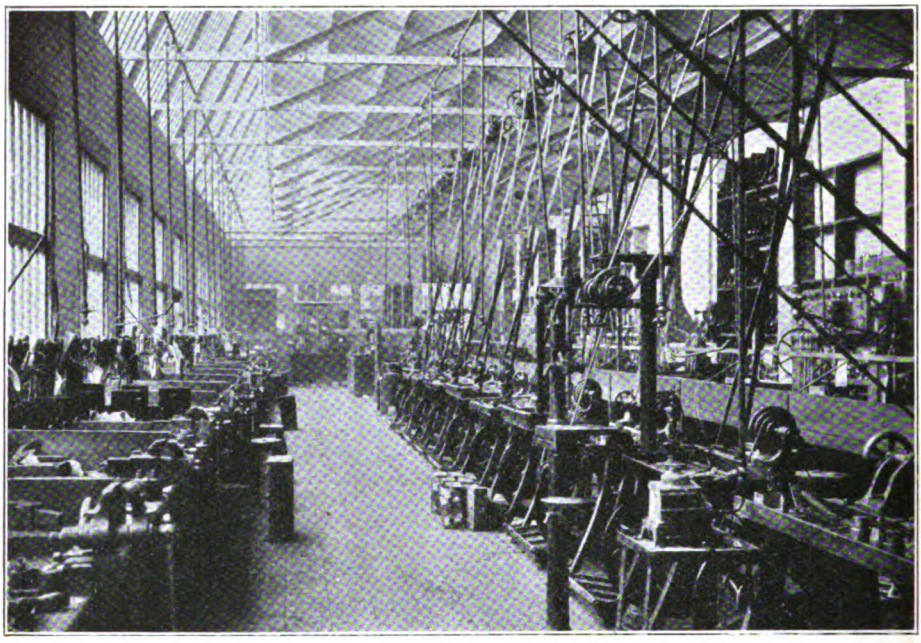
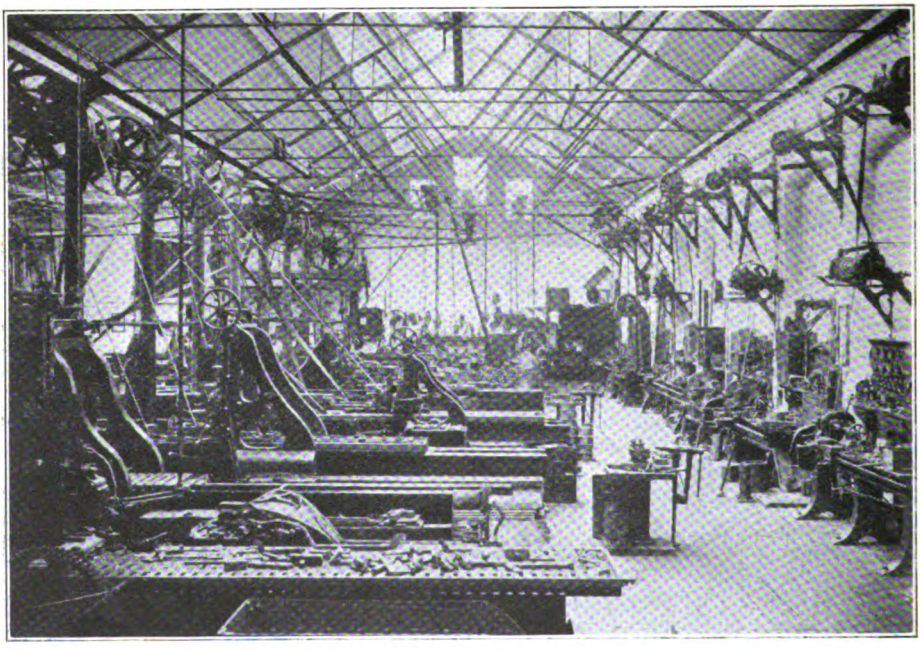


TELEGRAPH SHOP, No. 1.



MACHINE SHOP.

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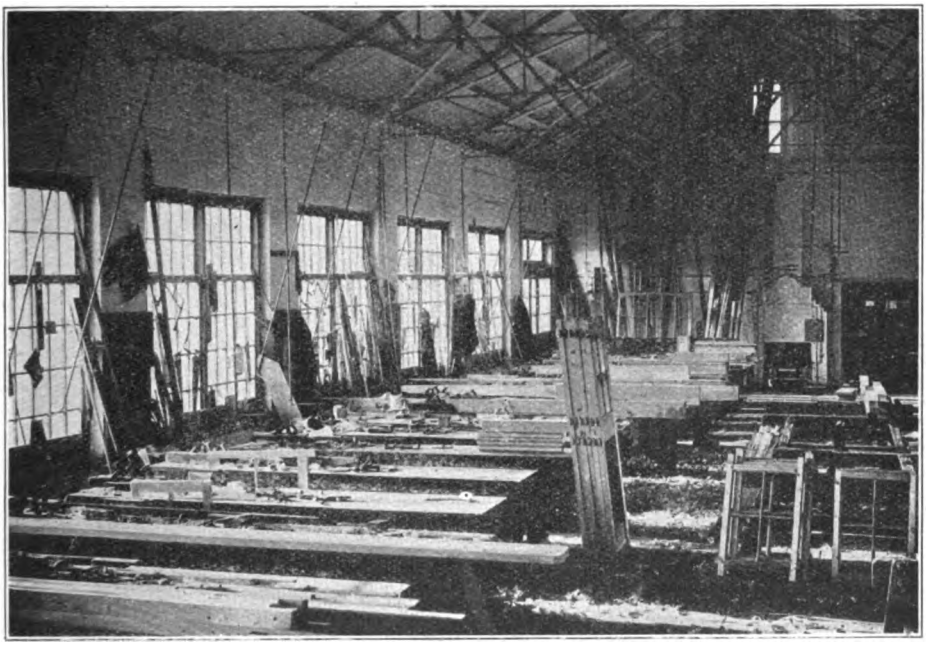
1,645 signal boxes, 21,600 signals, 48,280 working levers, 11,310 points, 3,428 facing-point locking gear sets, 9,200 independent discs, 594 ground frames, 298 level-crossing gates, 433 weighted fouling bars, 2,228 detonator-placing machines, 870 track circuits, 570 electrically-worked signals, 10,850 telephones, 29,289 long-burning lamps, 4,460 portable accumulators, 5,100 clocks. The number of employees in the signal department is 2,084. Of these, 424 are engaged in the works at Reading. There are 21 subsidiary depôts of the department in various parts of the line, and in connection with these the remaining 1,660 men are employed.



CARPENTERS' SHOP.

The work in the drawing office embraces the preparation and examination of signalling and electrical schemes of all kinds, and the making of estimates, signalling sketches, diagrams for track circuits, and schemes for electric signalling, telephones and electrical power. In the printing room there are two Hall automatic arc-lamp machines used for making the white and blue prints required by the department.

All Great Western Railway clocks for repairs are handled in the clock shop, which is equipped with a combination polishing head, a Lorch precision lathe and a sensitive drill, all of which are driven by small electric motors. In the accumulator shop the portable accumulators for track circuiting, locks, battery signal machines, in the Reading, West Ealing and Gloucester districts, and for automatic train control are charged, about 30,000 a year being dealt with. The regulation of the charging current to the Reading central storage batteries, which supply all power for operating the instruments, electric locks, electric detection, and telephones in the five signal boxes, for the telephone exchange, telegraph and traffic control offices, is carried out here. Direct current at 200 volts from the Reading Electric Supply Company is used.

In the coil-winding shop coils of all kinds are wound. A "Leesona" coil-winding machine, supplied by the Igranic Electric Company and driven by a ¼ h.p. D.C. motor, is provided, as well as an impregnating plant for coils.

Two Taylor-Hobson engraving machines driven by electric motors, are installed in the engraving shop and do the whole of the

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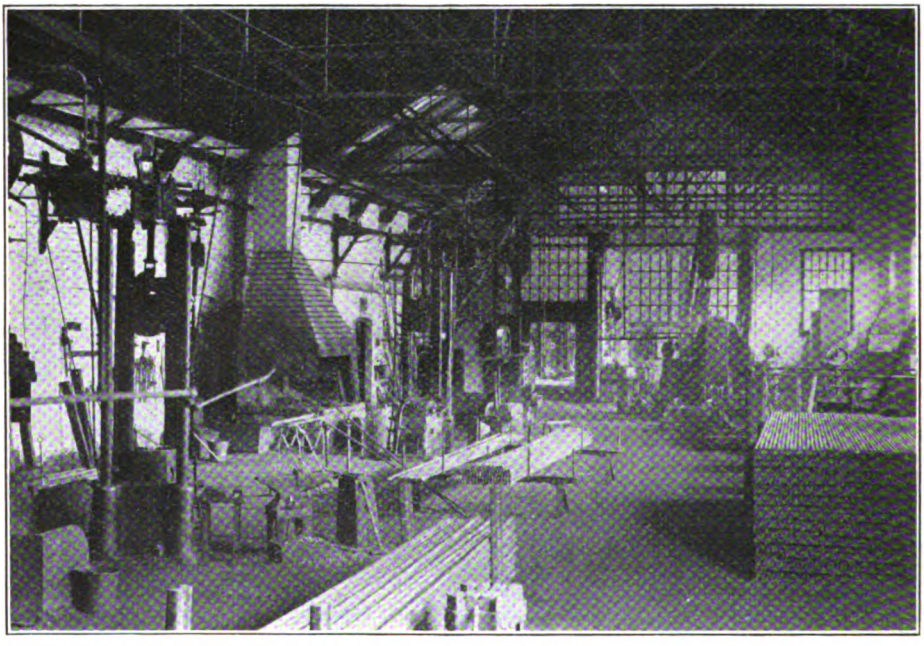
engraving required for the description-plates for locking frames, block instruments, telephones, &c. Two stamps are situated in the stamping shop for stamping the fast joints in point rodding. There are also two shearing machines.

There are three telegraph shops. The work in shop No. 1 consists of repairs to block instruments, single needle instruments, track indicators, electric repeaters, electric bells and telephones. New types of instruments are sometimes first made here. The shop is equipped with instrument and screw-cutting lathes, drilling and milling machines, circular saws, a Polifax lapping machine, a grindstone, a foot punch, and a tapping machine. There is also a gas furnace for hardening tools.

The construction and repair of electric token (tablet and staff) instruments, and automatic train control apparatus, are done in telegraph shop No. 2. The equipment comprises hand and screw-cutting lathes, milling, tapping, and a "Pfeil" drilling machine. There is a trial signal post for testing new and repaired apparatus. A 15-h.p. electric motor drives the machinery here, and in Nos. 1 and 3 telegraph shops. The equipment in telegraph shop No. 3 consists of a variety of light machine tools, a Selig-Sonenthal vertical lapping machine, and a trial signal post. Battery signal machines are overhauled and repaired here, and the manufacture and repair of contact boxes for arms, levers, slots and facing points, electric locks and re-setters, are performed.

Locking frames of all sizes are erected in the erecting shop. The shop contains presses for making parallel-bar brackets and extension-ends for the blades of facing-points. A part of the premises is used for the assembling of signal-box roofs and framing. The machines in the machine shop are principally shaping, slotting and milling. There are also a few lathes, a machine for punching out fibre rail-section insulations for insulated rail-joints, a three-tool planer for locking trays, one for cam cutting, and another for shaping quadrants for locking frames.

The locking-gear shop is a combined machine and erecting shop, well equipped with lathes, and drilling, slotting, shaping, boring and other machines. There is also a machine for punching the holes required



STAMPING SHOP.

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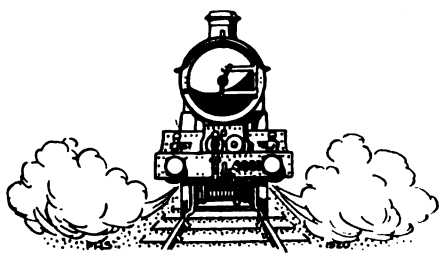
in the side insulations of insulated rail-joints for track-circuiting purposes. All classes of signal and locking-frame work are machined here. The smaller locking frames, facing-point lock and bar fittings, disc signals, cranks, wheels, and other gear are assembled here. The plant is driven by a 120 i.h.p. steam engine. There are also a 10-h.p. vertical steam engine and a 9·5-h.p. electric motor for emergency use. The electric motor drives a group of machines which may be required when steam power is not available.

The grinding shop contains six grinding machines, including one for grinding circular saws. All the machines are efficiently protected and provided with water troughs for catching the dust. They are driven by the 120 h.p. engines situated in the locking-gear shop. The signal-erecting shop is a place where all descriptions of signals are fitted up completely. An interesting machine here is a log-cutting table which is capable of a cut in one length of 54 ft. All patterns for the department are made and repaired in the pattern shop. A 9·5 h.p. Siemens electric motor drives the machines

In the carpenters' shop all joinery work —consisting largely of that for signal-boxes and level-crossing gates—is made. Planing and rebating is performed by a motor-driven Robinson moulding machine fixed here. A planer, for heavy long timber and having a travelling bed 21 ft. long, is installed. A machine of special interest is an overhand plane, with circular pattern spindle, which has eliminated accidents with this class of machine. The power for this shop is by a 50-h.p. Crompton electric motor, which also drives the plant in the signal-erecting shop.

In the engine house (No. 1) is an auxiliary steam engine of 70 i.h.p. supplied with steam by two locomotive-type boilers. The boilers also provide steam for working the steam hammers in the smiths' shop, and for heating the general offices. The steam engine in engine house (No. 2) is supplied with steam from two locomotive-type boilers working alternately, the working pressure being 130 lb. per square inch. The engine, which is over 60 years' old, is of the open horizontal single-cylinder double-acting slide-valve type, having a bore of 10½ in. and stroke of 2 ft. 8½ in. It runs at 70 r.p.m. and is of 120 i.h.p. The boilers are fed by injectors with soft water from the Reading locomotive department water-softening plant.

The sidings are laid out to give access to the erecting shops and stores department warehouses. A small locomotive performs the necessary shunting operations. In addition, there is a lamp shop, where lamps, for signals, level-crossing gates, repeating signals, &c., are made and repaired; a gate shop, wherein the locking fittings and ironwork for level-crossing gates are assembled; two smiths' shops, one containing four steam hammers and other appliances and the other fitted for work in connection with the signal-erecting shop, and a test room, where repaired electrical apparatus and new instruments are thoroughly tested.



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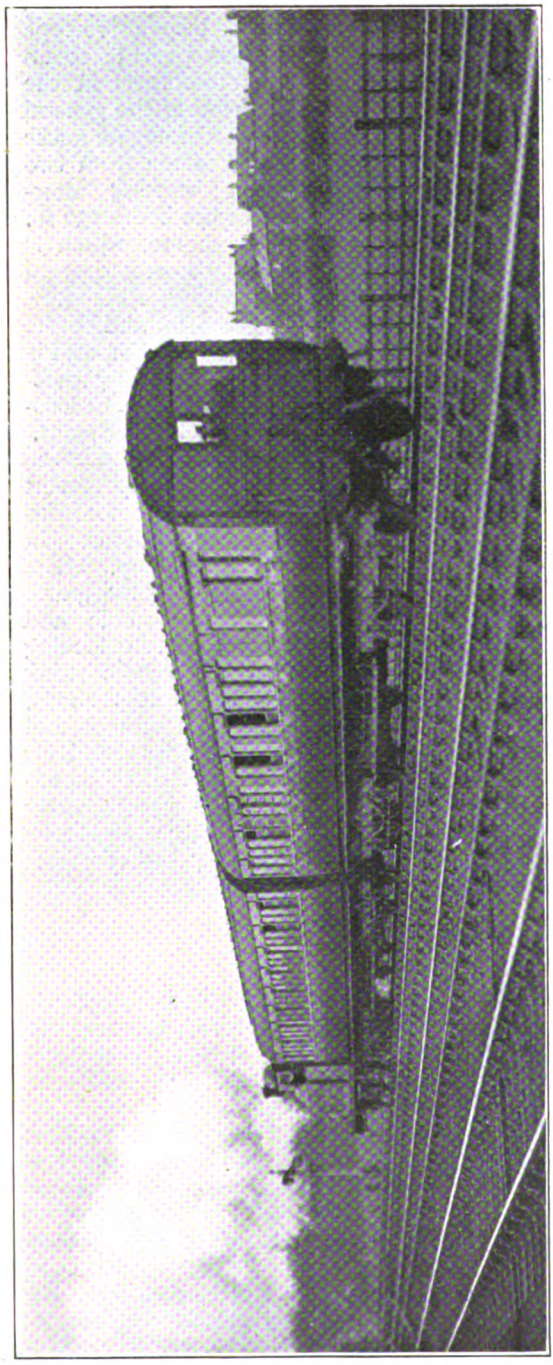
"Reversible" Steam Train, London & N.W. Railway.



GENERAL VIEW OF TWO-COACH "UNIT" TRAIN, DRIVER'S CONTROL COMPARTMENT LEADING.

SINCE February 6, 1922, a "reversible" or "push-and-pull" train has been used for working locally between Manchester (Victoria) and Atherton, and by the courtesy of Mr. Ashton Davies, M.B.E., General Superintendent (Northern Division), we are enabled to illustrate and describe the equipment of the train employed.

The train normally consists of a tank engine adapted to run with two bogie coaches, but can be increased to four or six coaches when the volume of traffic calls for further accommodation. The vehicles adapted for use in this way are arranged in pairs, providing nine third-class compartments in one vehicle, seating 108 passengers, while the composite carriage has two first-class and four third-class compartments seating 64 passengers, together with luggage and driver's compartments. There is thus total accommodation for 172 passengers for each unit pair of vehicles. The length over buffers of each coach is 57 ft. 7 in. and the width over the body is 9 ft. The engine is a 2-4-2 radial tank, the diameter of the coupled wheels being 5 ft. 8 in. and of the radial wheels 3 ft. $7\frac{3}{8}$ in. Cylinders are $17\frac{1}{2}$ in. diam. and 26 in. stroke; boiler pressure is 180 lb. per square inch; length over buffers, 37 ft. 2 in. When the train is made up to six coaches the total length over buffers is 382 ft. 8 in.

In one direction the engine is operated as with an ordinary steam train, but in the other direction the driver operates the engine from the driver's compartment at the rear end of the train. A two-coach train is illustrated when being operated with the driver's compartment leading.

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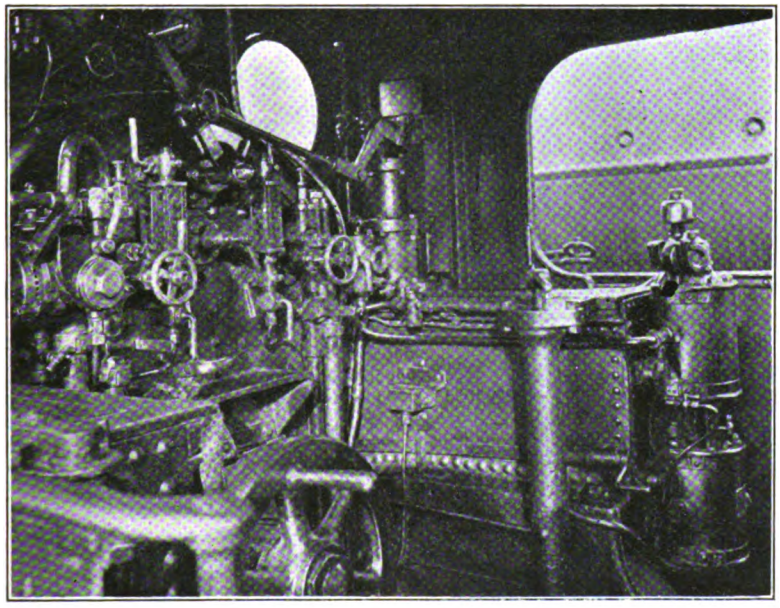
The engine and train are fitted with the automatic vacuum brake. A compressed-air apparatus is installed to operate the regulator handle on the engine, when the driver is controlling from the driver's compartment.

The regulator handle is shown connected to a rod by means of a French pin; the other end is coupled to an operating air cylinder by means of a bell crank lever. The operating cylinder contains two pistons, one larger than the other; both are mounted on the same piston rod. The chamber between the two pistons is directly connected to an auxiliary reservoir, to which air pressure is supplied through a back pressure valve, so that a sufficient air pressure is always available. The underside of the large piston can be put in communication with the main reservoir or the atmosphere under the control of the driver's compressed air valve. When air pressure is supplied to the underside of the large piston it is placed in equilibrium, and the air pressure from the auxiliary reservoir then forces up the small piston, and opens the regulator. When the air pressure on the underside of the large piston is destroyed, by opening the driver's compressed-air valve to atmosphere and closing the air supply from the main reservoir, the air pressure from the auxiliary reservoir forces down the large piston and shuts the regulator. By manipulating the driver's compressed air valve any desired opening of the regulator may be obtained. A view inside the engine cab, showing the air compressor and operating cylinders with connections, is reproduced.

Movement of the regulator on the engine is repeated to the driver by an electrical indicator fixed over the look-out window in the driver's compartment. The vacuum and pressure gauges are placed on each side of the electrical indicator in the driver's compartment, above the observation window. A pneumatic whistle is provided to give warning on the road.



INTERIOR OF ENGINE CAB, SHOWING REGULATOR FITTINGS, STEAM-DRIVEN AIR COMPRESSOR, &c.

A special feature of this train is the driver's "safeguard" in the event of the driver becoming incapacitated when driving alone from the rear. If he releases his hold of the brake handle in this condition it will act as an "emergency handle," immediately shutting the regulator and applying the brake.

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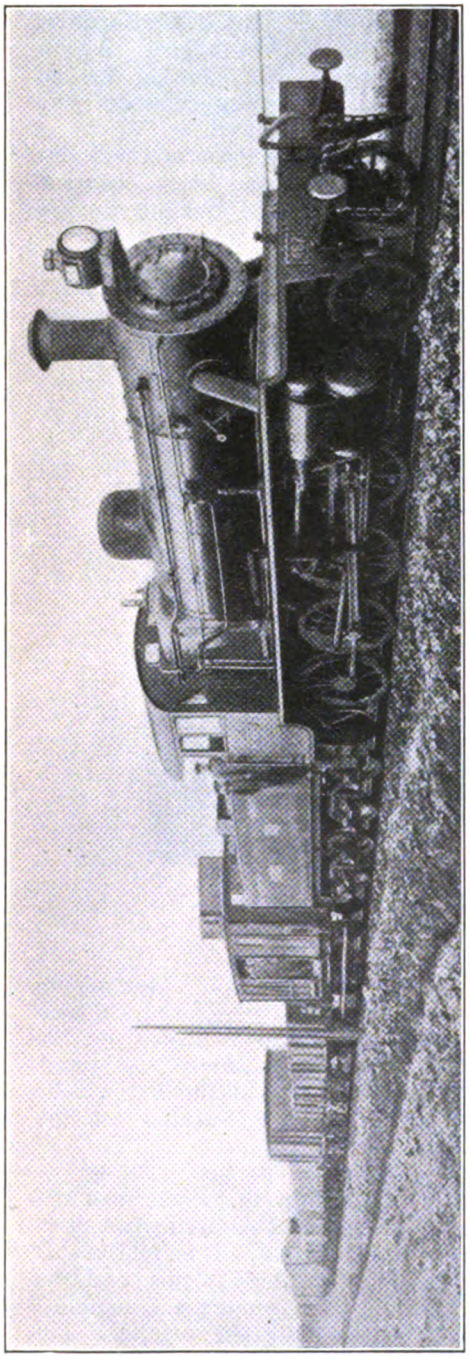
A Spanish Railway and its "Consolidation" Locomotives.



BALDWIN 2-8-0 TYPE LOCOMOTIVE, ANDALUSIAN RAILWAY.

LOCATED in a very mountainous section of the Southern part of Spain, the Andalusian Railway, which is the third largest railway in the country, has its main workshops and general offices of the director at Malaga, a seaport on the Mediterranean Sea.

At its extremities the railway touches Belmez on the nort, Grenada on the east, Algericas on the south and Bonanza on the west. It has 1,302 km. of track open, having a 5-ft. 5¾-in. gauge. Its rolling-stock consists of 198 locomotives, 611 carriages and 5,170 wagons. It also operates three steamships and one motor coach for inspection purposes.

On August 26, 1920, the Baldwin Locomotive Works completed and shipped 15 Consolidation (2-8-0) type locomotives to this railway. The locomotives have copper fireboxes with rocking grates. When the order was placed a plain bar cast-iron grate was specified, but on account of the low grade of fuel used, it was later decided to change to the usual American type of rocking grates with a ⅝-in. air space between the bar fingers. The wisdom of this decision is borne out by the fact that the railway has reported an unusually low coal consumption on these locomotives, which is very important to the company as fuel is scarce and expensive. They burn briquettes composed of one-third best English steam coal, one-third lower grade Spanish coal, the balance of coal dirt and a binder of asphaltum.

Locomotive boilers for Spanish railways are tested under Spanish law. This law requires the hydraulic test of the boiler to be made at a pressure of 17·25 kg. per square centimetre instead of 25 per cent. above boiler working pressure, as required by the Inter-State Commerce Commission of the United States, which latter standard is the one usually employed by American locomotive manufacturers. These boilers were built according to Baldwin Locomotive Works practice, which specified a test of somewhat greater severity than required by United States law.

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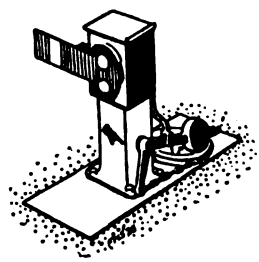
The Spanish test is most severe and gives testimony to the excellence of Baldwin boiler construction. The exact conditions to be met were not known at the time of manufacture, and the boilers for these locomotives were given a shop test of 213 lb. per square inch. The re-test at destination as made under Spanish law was approximately 245 lb. per square inch, or an excess of 15 per cent. above the manufacturer's test and 22½ per cent. above the test necessary under the United States laws.

The locomotives were erected in the railway company's own shop, which is a combination erecting and boiler shop 65 ft. high, 90 ft. wide and 425 long. In it are eight erecting pits, each long enough for two engines, and served by an electric travelling crane of 30 tons capacity. The minimum erection time for these locomotives was 21 days, the maximum was 41 days, and the average was 29·9 days.

Specifications for these locomotives are :—

Gauge	5 ft. 5¾ in.
Cylinders—	
Diameter	19 in.
Stroke	26 in.
Boiler—	
Diameter	5 ft.
Working pressure	160 lb.
Fuel	Soft coal.
Driving wheels, diameter outside	4ft. 7½ in.
Engine truck wheels, diameter	3 ft. 5 in.
Wheelbase—	
Rigid	15 ft. 4 in.
Total engine	24 ft. 1 in.
Total engine and tender	49 ft. 5½ in.
Weight—	
On driving wheels	50 tons 9 cwt.
On truck, front	9 tons 16 cwt.
Total engine	60 tons 5 cwt.
Total engine and tender	104 tons 2 cwt.
Tender—	
Wheels, number	8
Wheels, diameter	3 ft. 2 in.
Tank capacity	3,500 gallons
Fuel capacity	7 tons
Heating surface—	
Firebox	126 sq. ft.
Tubes	353 sq. ft.
Tubes	793 sq. ft.
Total	1,272 sq. ft.
Superheater	309 sq. ft.
Grate area	25 sq. ft.

These locomotives are being used on the division between Alora and Gobantes. The route traverses a very mountainous district, thus making a continuous haul for the locomotives for about 40 miles, several miles of which are a succession of tunnels with the tracks constantly wet from the seepage through the rocks. Most of the steep grades are combined with curves many occurring in the tunnels where the rails are extremely slippery. In an official test of locomotive No. 467, hauling train No. 201, a load of 270 metric tons was pulled from Alora to Gobantes, a distance of 19 km. up a ruling grade of 3 per cent., gaining 11 min. on the scheduled time. The train hauled is considered a 15 per cent. overload according to the railway company's calculations for tonnage allotment.



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Summer Train Services. [No. II.]

LAST month the principal characteristics of the notable developments in train facilities and services arranged for the 1922 summer season, were reviewed. In many cases, however, the actual time-tables were not then available, and in this article, therefore, some of the more outstanding features are further considered, railways which were not included last month also receiving attention.

Caledonian Railway.

In addition to the main line improvements mentioned last month, numerous semi-fast trains have been added to the various services of a holiday character between Glasgow, Edinburgh and Dundee and Gleneagles Crieff and Balquhidder; also residential express trains between St. Fillans, Comrie, Crieff and Perth and Dundee, between Kirriemuir, Edzell, Brechin, Forfar and Dundee, and between Glasgow and Edinburgh and Lanark, Peebles and the Upper Ward of Lanarkshire, including the popular "Tinto" expresses. The services to Clyde Coast resorts include additional expresses in connection with the steamers, among them the 4.30 p.m. from Glasgow to Wemyss Bay, giving an arrival at Rothesay at 6 p.m., and the corresponding morning service. The steamer programme also includes a number of interesting tours, evening cruises, &c. Services to the Isle of Man, via Ardrossan, and the Loch Lomond services have been resumed, the latter in conjunction with various tours arranged by the Company.

Glasgow and South Western Railway.

From the particulars given last month, it will be seen that the Clyde Coast and Western Islands of Scotland now have many additional facilities by the Midland route as compared with the situation a year ago, which, coupled with the re-introduction of tourist and excursion bookings, should induce a large increase in travel. The Ayrshire seaboard towns of the Firth of Clyde are, of course, served by trains in direct connection with the Midland expresses, and in a number of cases the train service has been improved as compared with last year. Locally, *i.e.*, between Glasgow and the Clyde and Ayrshire Coast places, the former generous services of both trains and steamers, have been augmented and accelerated.

Great Central Railway.

As previously indicated, the outstanding feature of this Company's arrangements is the large number and variety of through services, the Great Central constituting the connecting link. The importance of the Banbury-Woodford section, though only a few miles in length, is, indeed, becoming more and more apparent. If the only result of "grouping" were to be the extension of services of this kind, in regard to which the Great Central has been a pioneer, it would be justified: in any case such "Cross-country services," usually "Sea to Sea," as those with which the Great Central Railway is associated must tend to add very greatly to the conveniences of travel generally, apart from the standard main line journeys.

Taking the arrivals at Banbury from the north the following interesting series of through services may be noted:—11.30 a.m. Sheffield (8.55 a.m.) to Oxford and Bristol; 2.12 p.m. Newcastle (8.0 a.m.), York and Sheffield to Oxford, Southampton, and Bournemouth (through carriage from Bradford); 3.26 p.m., Newcastle (9.30 a.m.), York, Sheffield, Nottingham and Leicester to Cardiff and Swansea; 7.24 p.m., Scarborough (1.20 p.m.), York, Sheffield, Nottingham and Leicester to Oxford with through carriages from Glasgow (8.40 a.m.) and Edinburgh (10.15 a.m.) to Southampton; 10 p.m. Aberdeen (9.45 a.m.), Glasgow (12 noon) and Edinburgh (1.30 p.m.) to Penzance; 2.33 a.m. York (10.3 p.m.), Nottingham and Leicester to Oxford and Bristol. All except the last have restaurant cars. There are also six other services linking up the Great Central and Great Western Railways via Banbury. In the opposite direction, the north-bound departures from Banbury are: 11.25 a.m. Oxford to York and Scarborough, with through coaches from Southampton to Edinburgh and Glasgow; 12.43 p.m. Swansea to York and Newcastle; 1.2 p.m. Bristol to Sheffield; 3.48 p.m. Bournemouth and Southampton (through carriage to Bradford) to York and Newcastle; 7.42 p.m. Penzance to Glasgow and Aberdeen; 10.35 p.m. Swindon to Sheffield and York. These also provide restaurant car facilities, and in conjunction with seven local connections link up journeys from the south-west with the Great Central Railway, within a very wide range. There is also the through Sunday service each way between Sheffield and Swansea.

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From the train running point of view the most interesting items are the acceleration of the 3.20 p.m. ex Marylebone to reach Leicester at 5.9 p.m., run thence to Nottingham in 25 min. and onwards to Sheffield in 48 min ; while the 6.20 p.m. is due at Leicester (slipping a coach at Woodford and Hinton), in 114 min. via High Wycombe. The former train has a through carriage for Halifax, and the latter for Barnsley. In the opposite direction the 8.12 a.m. from Mansfield runs non-stop from Leicester to London in 112 min. ; and the 2.15 p.m. from Manchester from Leicester to Marylebone in the same time. There are also numerous improvements on various holiday traffic routes other than those from London.

On Sundays a new train leaves Sheffield at 2.7 p.m. for Selby (connecting with a train for Hull) and York (connecting with an express to Newcastle, Edinburgh, &c.). The new train in the opposite direction leaves York at 4.10 p.m., with corresponding connections. A service of trains is on Sundays provided between Nottingham and Mansfield and trains added on various other sections. A comprehensive programme of weekly and fortnightly excursions, as well as day trips, has been arranged for the summer season.

GREAT EASTERN RAILWAY.

Commencing July 16, an " All-Pullman " express was inaugurated on Sundays between Liverpool Street and Clacton-on-Sea ; fare, including Pullman supplements : 28s. First class, 14s. Third class. Ordinary and season tickets are available on payment of the Pullman supplement. The down train leaves Liverpool Street at 10.0 a.m. and is due at destination 11.37 a.m. ; the up train leaves at 5.10 p.m., due in London 6.45 p.m.

On week-days, on the Clacton and Walton routes, the 10.26 a.m. train on Saturdays runs through from Liverpool Street to Clacton-on-Sea without stop. The 5.30 and 6.39 p.m. trains from Liverpool Street to Clacton and Walton run on Saturdays as on other days. On Saturdays a non-stop train leaves Clacton for Liverpool Street, until September 23, at 2.55 p.m. There is also a Saturday non-stop restaurant car express from Clacton at 4.10 p.m. to London.

Photo.] HIGHLAND RAILWAY. [*A. B. Noble.*

South-bound express near Tomatin. Drummond 4-4-0 No. 8, " Ben Clebrig," and 4-6-0 No. 59, " Foulis Castle."

A number of additional trains are provided on the holiday traffic routes, serving principal intermediate stations or in replacement of stops now cut out. Additional trains are also provided between Cromer, Yarmouth, Lowestoft, Ipswich and Norwich, Felixstowe and Ipswich, and on the Harwich branch, for the benefit of business travellers, to provide later and earlier facilities than those at present available or to give further connections between trains on various routes.

On Sundays there is a new restaurant car service from Cromer at 5.40 p.m. to Liverpool Street. Numerous other additions and accelerations are provided. Restaurant cars run on the 9.20 a.m. from Liverpool Street to

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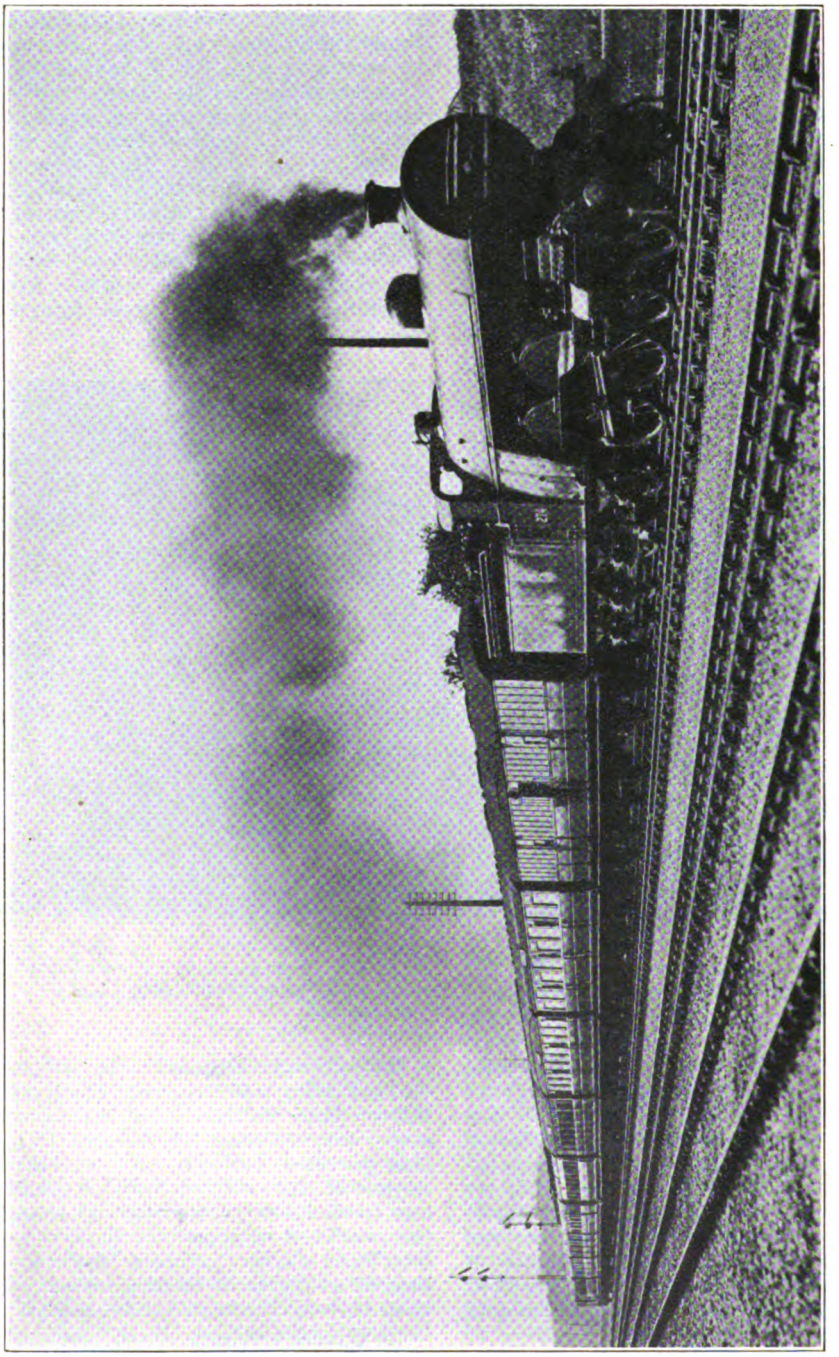

Photo.] GREAT NORTHERN RAILWAY. [*F. E. Mackay.*

Down Anglo-Scottish Express near New Southgate. 4-4-2 Engine, No. 274.

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Cromer and the 7.0 p.m. from Yarmouth (South Town) to Liverpool Street. The restaurant cars attached to the 10.5 a.m. from Liverpool Street to Felixstowe now run to Yarmouth (South Town), while those hitherto on the 7.10 p.m. from Felixstowe to Liverpool Street start from Cromer.

GREAT NORTHERN RAILWAY.

It is interesting to note that the 10.0 a.m. from Leeds now breaks through the 4-hour "convention," being due at King's Cross at 1.55 p.m. In certain of the summary time-tables of the July 10 time books, the facilities given by the Great Central and Great Eastern Railways are combined with those of the Great Northern Railway. As previously mentioned the 9.50 a.m. relief "Scotsman" runs through to Doncaster, although it is given 3 hours 7 min. against the 2 hours 56 min. of the 5.30 p.m. The new 5.35 p.m. reduces the time from London to Grantham to 2 hours 2 min. Between London and Peterborough the standard timing is now 87 min. The 9.50 a.m. and the 1.20 p.m. Scottish trains are not advertised to call at York. The 7.30 p.m. Highland express is booked to Grantham in 126 min. and thence to York in 96 min. Some of the up trains reduce the Peterborough–King's Cross time to 84 and 85 min. and the 8 p.m. from Grantham is allowed only the even 2 hours to King's Cross.

Among other improvements may be noted the following:—The 10.15 a.m. luncheon car express from Newcastle leaves at 10.20 a.m., and is due at King's Cross 4.30 p.m., an acceleration of 35 min. On the Harrogate and Ripon service the 7.15 a.m. from King's Cross has the usual connection to Harrogate, due 12.5 p.m., while the 11.20 a.m. from King's Cross gives an arrival at Harrogate at 3.45 p.m. The 1.40 p.m. from King's Cross is accelerated to reach Harrogate at 6.10 p.m. and is extended to Ripon, while the 11.20 a.m. from Harrogate starts from Ripon at 10.50 a.m. and is due at King's Cross at 4.0 p.m. New through expresses leave Harrogate at 2.30 p.m. and 3.45 p.m., arriving King's Cross 7.15 and 8.10 p.m. respectively.

The 11.20 a.m. from King's Cross also has through connections for Scarborough, while a new train at 1.50 p.m. constitutes a through luncheon car express for Scarborough and Whitby. In the reverse direction the through services leave Whitby at 10.40 a.m. and Scarborough 11.30 a.m. and 3 p.m. The new 5.35 p.m. from King's Cross previously mentioned is also a through dining car express for Hull, due 10.2 p.m., the return train leaving Hull at 9.5 a.m. as a luncheon car express. The 5.40 p.m. dining car express from King's Cross to Leeds starts at 5.45 p.m. The 9.55 a.m. luncheon car express from Leeds starts at 10 a.m. The 3.30 p.m. dining car express from Leeds to King's Cross starts at 3.15 p.m., and reaches London at 7.15 p.m.

GREAT WESTERN RAILWAY.

To some extent the July 10 train services of this company carry out usual summer methods, but several interesting features are introduced. In the case of West of England services the following additions and alterations may be noted, affecting trains from Paddington: 9.15 a.m. Minehead, Ilfracombe and Torquay lines (coach connections to Lynton and Lynmouth), calling at Reading and Westbury to Taunton; 9.30 a.m. Weymouth and Channel Islands day service, calling at Reading and Westbury; the 10.30 a.m. "Cornish Riviera" express ceases to slip carriages at Taunton and Exeter; 11 a.m. Penzance, Kingswear, and Newquay, non-stop to Exeter, due 2 p.m.; 11.15 a.m. Bristol, due 1.15 p.m., "Bath Spa" slip due 1 p.m.; 12 noon, Kingswear, non-stop to Torquay, due 3.35 p.m.; 12.5 p.m. Minehead and Ilfracombe (coach connections to Lynton and Lynmouth), calling at Reading and Westbury to Taunton; and 1 p.m. Weston-super-Mare, due Bristol 3 p.m. (coaches slipped at Bath at 2.45 p.m.—105 min. for 106⅞ miles, as in the case of the 11.15 a.m. down). In the opposite direction the 8.30 a.m. from Plymouth slips carriages at Reading; the 9.30 a.m. from Ilfracombe is accelerated via Bristol and Bath to London, due 4.5 p.m.; the up Torquay non-stop leaves at 12.10 p.m., due Paddington 3.45 p.m.; a train from Truro at 9.50 a.m. calls only at Reading after Exeter; the 5.0 p.m. from Bristol to Paddington slips carriages at Swindon, to connect with the 6.15 p.m. thence to Sheffield, York, Newcastle, Edinburgh, Aberdeen, &c.; the 4.10 p.m. from Plymouth runs via Westbury and slips carriages at Newbury (this train, due at Paddington 9 p.m., has a connection from Ilfracombe at 3 p.m., and the train from Bristol at 7.32 p.m. is maintained).

Other facilities in connection with West of England services include a Saturday train (July 15 to August 26) from Bristol at 10.38 a.m. for the Torquay line; a continuation of the 10.15 a.m. ex Birmingham, from Bristol at 12.45 p.m. to Plymouth; a train from Bath at 1.38 p.m. for the Torquay line; 9.10 a.m. from Liverpool (Lime Street), extended to Newquay and Falmouth; 10.5 a.m. from Newquay and 10.35 a.m. from Falmouth taking up the running of the 1.10 p.m. from Plymouth to Liverpool, Manchester, &c.; Channel Islands day boat train from Weymouth at 3.45 p.m.

On the Birmingham route the following additions may be noted (two further 2-hour

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trains to and from London are given) :— From Paddington, 9.10 a.m. for Aberystwyth, with through carriages for Pwllheli, &c.; 10.15 a.m. for the Cambrian Coast (July 14 to September 16), calling at Ealing Broadway and due at Snow Hill, Birmingham at 12.20 p.m. (on Saturdays not booked to call at Birmingham or Wolverhampton, a separate train then being provided from Snow Hill) 12.50 p.m. for Leamington, Birmingham (2 hours) and Wolverhampton; 6.15 to Malvern altered to 6.5 p.m., due Worcester 8.45 p.m.; 7.10 p.m. Leamington, Birmingham (2 hours), Wolverhampton, Wellington and Shrewsbury. In the opposite direction : 9.5 a.m. Birkenhead to London, accelerated 10 min.; Pwllheli, 10.15 a.m., and Aberystwyth 12 noon for Birmingham (not Saturdays) and London (July 15 to September 18), and Aberystwyth 11 a.m. and 2.30 p.m. for Birmingham (Saturdays only, July 15 to September 16); 12.10 p.m. from Birkenhead, accelerated to leave Birmingham at 3.55 p.m. calling at Leamington and due Paddington 5.55 p.m. (separate train to Banbury, Oxford, &c., from Snow Hill, 4 p.m.).

Through services to and from the Southern lines include a train to Margate and Dover from Birkenhead (Woodside) at 8 a.m., Chester, Shrewsbury, Wolverhampton (Low Level), Birmingham (Snow Hill) 11.0, Leamington Spa, Banbury, Oxford and Reading (Great Western) 1.10 p.m., for Guildford, Redhill, Tonbridge (connection to Hastings), Ashford, Ramsgate Town 4.42, Margate (Sands) 4.54, Folkestone (Central) 4.12 and Dover (Marine) 4.30 p.m.; a train from Dover (Marine) at 9.45 a.m., Folkestone (Central) 10.5, Margate (Sands) 9.25, Ramsgate (Town) 9.38, Ashford (Hastings 9.45), Tonbridge, Redhill, Guildford 12 p.m., arriving at Reading at 1 p.m. for Oxford, Banbury, Leamington Spa, Birmingham (Snow Hill) 3.13, Wolverhampton (Low Level), Shrewsbury, Chester and Birkenhead (Woodside) 6.20 p.m.; a train from Cardiff (General) at 11.30 a.m., Newport 11.52, Bristol (Stapleton Road) 12.35 p.m., Bath, Trowbridge, arriving at Salisbury at 2.20, Eastleigh 3.19, Portsmouth and Southsea 4.4, Chichester 4.43, Bognor 5.7, Worthing 5.20 and Brighton 5.42 p.m., with connections to Southampton, Eastbourne, St. Leonards and Hastings; and a train from Brighton at 11.20 a.m., Worthing, Bognor, Chichester, Portsmouth and Southsea, Eastleigh 1.48, Salisbury 2.35, for Trowbridge, Bath, Bristol (Stapleton Road) 4.25, Newport 5.22 and Cardiff (General) 5.45 p.m. Improved connections are also made between Birkenhead, Manchester and the Cambrian Coast; Taunton, Weston-super-Mare, and Birmingham, via Stratford-on-Avon; Birmingham and Bristol and Cardiff and Swansea, and on many other sections.

On Sundays the "Cornish Riviera" express is restored at 10.30 a.m. from Paddington (non-stop to Exeter), and at 12.20 p.m.

Photo.] LONDON & NORTH WESTERN RAILWAY. [*A. Jackson.*

11.50 a.m. Manchester–West of England express leaving Wilmslow.
4-4-0 engine, No. 2578, "Fame."

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from Penzance, due Paddington 7.55 p.m. The 11 a.m. from Penzance starts at 10.40 a.m., and is due in London at 7.5 p.m. The 6 p.m. from Paddington to Shrewsbury serves Leamington and is due at Snow Hill 8 p.m. The 11 a.m. from Wolverhampton is also allowed 2 hours for the Birmingham-London run, due 1.40 p.m. Improved services are given from Bristol at 12.35 p.m.for Liverpool, &c., and by the 10.40 a.m. from Liverpool An interesting feature is that the July time-tables cover the Welsh systems now absorbed by the Great Western Railway Company. The following branches are now given services on Sundays; Newton Abbot and Moretonhampstead; Plymouth and Yealmpton; Chacewater and Newquay; Tenby and Pembroke Dock; Birmingham (Snow Hill) and Stratford-on-Avon; and Hatton and Stratford-on-Avon.

London and North Western Railway.

The outstanding feature of the July 10 time-tables is the generous character of the electric services provided between Broad Street and Euston, via Chalk Farm, and the reopened stations, thence to Willesden Junction and on to Watford. These are, however, dealt with elsewhere. In regard to the main line services, special interest attaches to the through services between Liverpool, Manchester, &c., and Brighton and Eastbourne ("Sunny South Special") and the South Eastern and Chatham Railway, via Willesden and Kensington; Southampton via Birmingham and Cheltenham; and Bournemouth and Swanage via Birmingham and Bath. There are also services from London at 11 a.m.to Central and North Wales; at 10.30 a.m. for the Lake District; at 10.30 a.m., 4.0 and 6.30 p.m. for Huddersfield, Halifax and various Lancashire and Yorkshire towns, including a connection to Bradford; new services on Sundays from Manchester at 10.45 a.m. for Plymouth; and the corresponding return arrangements. Also additional trains from all parts to North Wales, Blackpool and Morecambe, including trains to North Wales coast from various late Lancashire and Yorkshire stations.

In regard to the schedules of principal trains, several interesting features may be noted. On Mondays, Fridays and Saturdays the 10.30 a.m. from Euston is divided, the Blackpool, Morecambe and other through carriage facilities being then transferred to the 10.35 a.m. train. Both sections are booked non-stop to Crewe. Restaurant cars are run to Windermere, both when combined with the 10.30 a.m. and when run separately. The 11 a.m. is a combined North Wales (not stopping for through traffic to Rhyl, due 3.14 p.m.), and Central Wales, Swansea and Aberystwyth express, the division being ordinarily made at Stafford. The usual 10.35 a.m. from Euston is a through semi-fast luncheon car train for North Wales. There are now two 7.30 p.m. Scottish sleeping car expresses (except Saturdays). One, the Highland section, calls only at Crewe, Carlisle and Stirling to Perth; the other stops at Bletchley, Rugby, Crewe, and Wigan to Carlisle and conveys the Stranraer, Dundee and Aberdeen sections. The 9.20 p.m. for Glasgow is publicly booked to call only at Stafford to Carlisle. In the opposite direction the arrangements correspond, except that certain services are combined differently.

The 10.30 a.m. Lake District express above mentioned arrives Windermere 45 and Keswick 25 min. earlier.

The 9.30 a.m. from Euston for Blackpool, &c., calling at Willesden, Watford and Bletchley, gives intermediate passengers a through service. The trains between Brighton, Eastbourne, Margate and Ramsgate and the Liverpool, Manchester and Birmingham districts are, owing to their success, accelerated and given additional accommodation. The Belfast boat train leaves at 5.20 p.m. instead of 4.45 p.m., arriving Belfast as before. The 5.20 p.m. dining car express for Liverpool departs at 5.30 p.m., and ceases to call at Crewe. The 6.30 p.m. from Euston arrives in Manchester in about 4 and Huddersfield in 4¼ hours, with connections for Halifax, Bolton, &c. For the convenience of passengers crossing London, a service is introduced from Clapham Junction, Battersea, Chelsea, Kensington, &c., to Willesden, connecting with principal trains.

Seats may now be reserved on principal long distance trains at 1s. each on application to the stationmaster, Euston.

London and South Western Railway.

Principal features of the summer arrangements made by this company were covered last month. The full excursion programme came into force on June 5, including Continental arrangements, and "limited" express excursions on Saturdays, commencing July 15, to Portsmouth, the Isle of Wight, Bournemouth, Weymouth and the West of England. The number of tickets issued for these "limited" express excursions is limited to the seating capacity, and intending passengers are required to book in advance. Restaurant car facilities are provided on a generous basis, no fewer than 20 trains leaving Waterloo daily having them, including trains which run from dates in July. There are also the Birkenhead-Bournemouth, York and Bournemouth (commencing July 14 the car runs to and from Newcastle), Portsmouth and Plymouth and the new Brighton

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(11.20 a.m.) and Portsmouth (1.0 p.m.) and Cardiff services, with the return train from Cardiff at 11.30 a.m.

London, Brighton and South Coast Railway.

In addition to new trains mentioned last month, an entirely new through service of trains every week-day between Brighton and towns in the West of England served by the London and South Western and Great Western Railways was instituted from July 10. The train starts from Brighton 11.20 a.m., calls to pick up passengers only at Worthing 11.41 a.m. and Chichester 12.16 p.m. and arrives at Portsmouth 12.40 to Brighton, connecting there with the 8.10 a.m. express to Victoria; 10.45 a.m. Hastings to Eastbourne, connecting with the "Sunny South Special," and the 11.45 a.m. express to Victoria; and 12.8 p.m. Brighton to Angmering, in connection with the down 11. a.m. "Southern Belle" express.

Midland Railway.

Between London, Manchester and Liverpool the 2.25 a.m. St. Pancras to Manchester is accelerated to arrive at Manchester at 6.52; the 8.25 a.m. St. Pancras to Manchester is accelerated to arrive at Manchester at 12.55 p.m.; the 12.25 p.m. from St. Pancras to Manchester is accelerated to

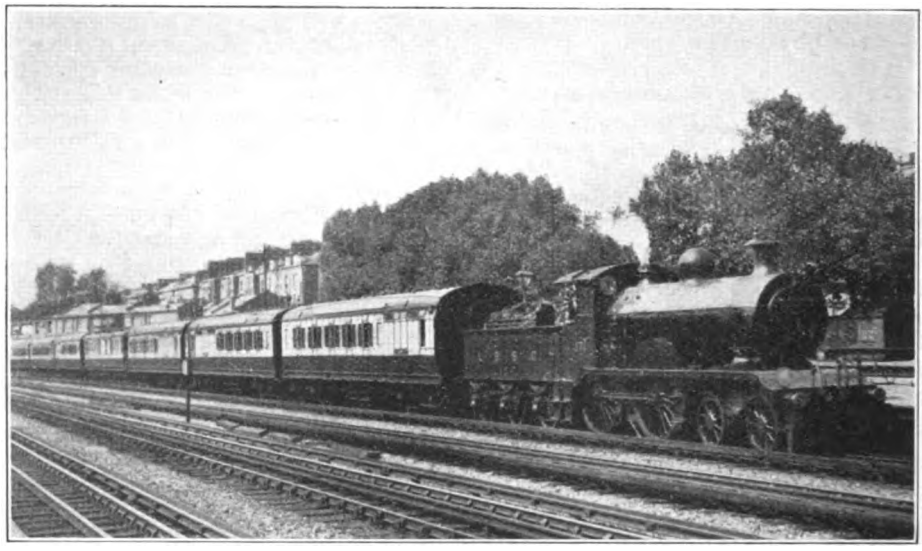

Photo.] [*E. A. Gurney-Smith.*

"SUNNY SOUTH SPECIAL" ENTERING ADDISON ROAD (KENSINGTON).

L.B. & S.C.R. locomotive No. 171.

1 .m. where it divides into two parts, running as follows:—The first part leaves Portsmouth 1 p.m. and arrives Salisbury 2.27 p.m., Westbury 3.15 p.m., Trowbridge 3.27 p.m., Bath 4 p.m., Bristol 4.25 p.m., Newport 5.22 p.m., Cardiff 5.45 p.m., Exeter 5.13 p.m., Barnstaple Junction 6.49 p.m. and Ilfracombe 7.48 p.m. The second part leaves Portsmouth 1.10 p.m. and arrives Southampton West 2.14 p.m. and Bournemouth 3.22 p.m. Connections from and to other towns served by these railways are provided and will no doubt be much appreciated. A similar train is run every week-day in the reverse direction.

Among various other alterations may be noted:—7.10 a.m. (Mondays only) Bognor arrive at Manchester at 4.25, and has a new connecting train from Cheadle Heath for Liverpool at 4.12 p.m.; the 7.20 a.m. Manchester to St. Pancras ceases to call at Bedford and is accelerated to arrive at St. Pancras at 11.35, and the 5.50 p.m. Manchester to St. Pancras no longer calls at Kettering and Wellingborough, and is accelerated to arrive at St. Pancras at 10.3. A new connecting train leaves Liverpool in connection for Cheadle Heath at 5 p.m. In the London, Nottingham, Sheffield, Leeds and Bradford services the 1.40 p.m. St. Pancras to Leeds leaves at 1 p.m., and is accelerated to arrive at Leeds at 6.12; the 1.20 p.m. St. Pancras to Bradford (Exchange) leaves at 1.50, and conveys

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a through portion for Leeds; the 4 p.m. St. Pancras to Nottingham leaves at 4.30, and stops at Wellingborough and Manton; and the 5.45 p.m. St. Pancras to Sheffield and Leeds leaves at 6.15, and is accelerated to arrive at Sheffield at 9.33. New expresses are provided at 5.40 p.m. from St. Pancras to Nottingham, calling at Bedford, Kettering, Leicester and Trent, and at 5.25 p.m. from Nottingham to St. Pancras, calling at Melton, Oakham, Manton, Kettering, Wellingborough and Luton.

On the western main line the 8.18 a.m. Derby to Bristol stops at Mangotsfield and gives a connection to Bath and Bournemouth; the 8.40 a.m. (Saturdays excepted) Birmingham to Leeds runs via Sheffield, and the 7.45 a.m. Bristol to Sheffield leaves at 7.40, and stops at Berkeley Road, to give an improved service to the Severn and Wye line. Among the new trains are:—12.5 a.m. Leeds to Derby, Birmingham and Bristol (except on Mondays), calling at Sheffield, Chesterfield, Burton, Cheltenham, Gloucester and Mangotsfield; 6.12 a.m. Derby to Birmingham, in connection with 7.45 a.m. Birmingham to Bristol and West of England; 8.35 a.m. Lincoln to Nottingham, Leicester, Birmingham and Bristol (for West of England), calling at Newark, Rolleston Junction, Gloucester (restaurant car); 12.3 p.m. Birmingham to Bournemouth (West), in connection with 10 a.m. from Manchester (London Road), with through carriages to Southampton and Bournemouth, also Swanage from June 19; 6.30 p.m. York to Derby, Birmingham and Gloucester, connecting with 11.30 p.m. Gloucester to Bristol and the West of England; 10.25 a.m. Bournemouth (West) to Birmingham, Manchester (London Road) and Liverpool (Lime Street); 6.10 p.m. Chesterfield to York, in connection with 2 p.m. from Bristol; 2.45 p.m. Bristol to Birmingham, Leicester, Nottingham and Lincoln, calling at Gloucester, Rolleston Junction and Newark (restaurant car); 10.5 p.m. (weekdays and Sundays) Birmingham to Derby and Nottingham (7.20 p.m. from Bristol), connecting at Nottingham with expresses to Scotland, and with through carriages from Bristol to Edinburgh and Glasgow. Through trains are also provided between Sheffield and Llandudno.

North British Railway.

In connection with the Trossachs tours via Aberfoyle a new train leaves Edinburgh at 9.10 a.m., with through carriages for Aberfoyle, via the Forth Bridge and Stirling, a favourite route with American tourists. In the opposite direction a through carriage for Edinburgh is attached to the 4.6 p.m. from Aberfoyle, also via Stirling and the Forth Bridge. On the West Highland system additional trains came into force on June 26, the 11.35 a.m. from Glasgow (Queen Street) to Mallaig, and the 12.0 noon from Fort William to Glasgow. Corresponding alterations and additions were also made on the Fort Augustus section. The rising seaside resort of Silloth on the Solway Firth is also having its share of new facilities, especially by the introduction of new trains between Carlisle and Silloth, to which are attached through carriages to and from Newcastle. These through carriages are run on the 1.20 p.m. from Newcastle and the 1.20 p.m. from Silloth.

The 7.25 p.m. East Coast express from Edinburgh to King's Cross leaves at 7.40 p.m. and the 3.40 p.m. from Aberdeen to Edinburgh, which has been accelerated, forms a connection with this train. A new sleeping car express leaves Inverness at 4.30 p.m. and Perth at 9.0 p.m. in connection with the 10.30 p.m. express from Edinburgh to King's Cross. A new restaurant car train leaves King's Cross for Edinburgh and Glasgow at 11.20 a.m., due Edinburgh (Waverley) 8.45 and Glasgow (Queen Street) 10 p.m. This train also conveys a through carriage from Southampton and a through carriage from Scarborough for Glasgow.

North Eastern Railway.

Additional through trains are provided between London and Harrogate by the 7.15 a.m. from King's Cross (via Leeds) and 11.20 a.m. via Knottingley, and from Harrogate to King's Cross at 2.30 p.m. via Leeds and 3.45 p.m. via Knottingley. The 1.40 p.m. King's Cross–Harrogate restaurant car express calls at Church Fenton when required to set down, and is accelerated to reach Harrogate at 6.10 p.m. (giving a connection to Pateley Bridge), and will run through to Ripon. The return service leaves Ripon at 10.50 a.m. and Harrogate at 11.20 a.m. Passengers are also permitted to travel from Ripon to London at 4.43 p.m. via Thirsk and Pilmoor, there connecting with a train due in London at 10 p.m. Through trains are provided from London to Scarborough at 11.20 a.m. and 1.50 p.m., returning at 11.30 a.m. and 3 p.m. The 1.50 p.m. ex King's Cross and 11.30 a.m. have through carriages to and from Whitby. Improved connections from Scarborough and Whitby are given with the 6.13 p.m. from York to London.

A number of important accelerations are also made in Sunday arrangements between Liverpool and Manchester, Great Central Railway, and York, Newcastle, Edinburgh and Hull, and, in the opposite direction, between Edinburgh, Hull and Nottingham and Edinburgh and Leeds, principally by arranging new connections at

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Photo.] [*E. A. Gurney-Smith.*

THE FIRST LIVERPOOL & MANCHESTER-KENT COAST THROUGH RESTAURANT CAR EXPRESS ENTERING ADDISON ROAD (KENSINGTON).

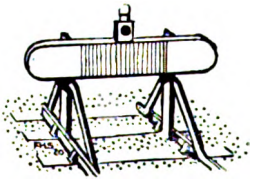
S.E. & C.R. rebuilt 4-4-0 locomotive No. 502.

Selby, but resulting in considerable savings of time for through journeys. Numerous additions and accelerations are also included in the local train services of the North Eastern system, though these need not be set out here in detail. There are also additional expresses between Newcastle and Carlisle, Leeds and Harrogate, and Scarborough, Whitby, Bridlington, Filey, &c.

SOUTH EASTERN AND CHATHAM RAILWAY.

The new through services in conjunction with the London and South Western, Great Western, and London and North Western Railways were set forth last month. Also the accelerations of trains between the London termini and Kent Coast resorts. An unusual feature of the summer time-table is the inclusion of period excursion trains, trains which do not run during school vacations and a number of third class only suburban trains.

As already mentioned, "Parallel" working has now been applied to the London area between 5 and 7 p.m. Trains are booked at London Bridge at 2-min. intervals, doubled in the case of trains from Cannon Street, routed to run parallel on non-conflicting routes, every four min., and with one train from Charing Cross at the intervening 2 min. Here and there is only one Cannon Street train. But from 5.15 until 6.57 p.m. the 2-min. sequences are maintained almost without a break, and in most cases the Cannon Street 4-min. trains are doubled, giving, with the alternating Charing Cross trains, two or three down trains every 4 min.; the total during this period being 68 down trains.



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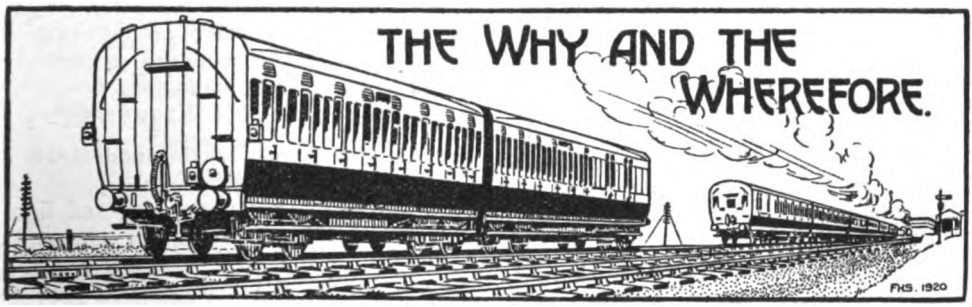

RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions and weights of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. No reader should send more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, the pages of the "Railway Year Book" should be consulted. The twenty-fifth Annual Edition of this standard railway reference work is on sale at 5s. net, or by post, from the* RAILWAY MAGAZINE *Offices, 33, Tothill Street, Westminster, London, S.W.1, to any part of the world, 5s. 9d.*

Time-Table Errors.

Mistakes such as those you mention can no doubt be noted frequently, especially in local time-tables, many of which are, unfortunately, rather carelessly prepared. The instances you quote are, however, somewhat easily explained by the fact that, as you yourself mention, alterations have been made without ensuring that the previous entries were removed. At the same time, your own inferences are not above question. Thus, the 4.30 p.m. from Victoria slips coaches at Three Bridges, the detached portion continuing as an Eastbourne train and giving an arrival at Haywards Heath at 5.31, by which time the main train has almost reached Brighton, where it is due at 5.35 p.m. The portion which serves Haywards Heath does not go to Brighton at all. Your reference to the "Sunny South" special is also not clear. This train leaves Kensington (Addison Road) at 3.25 p.m., and East Croydon at 3.52 p.m.

[Reply to F. E. MORGAN.]

Lost—A Guard.

Instances such as you mention, wherein the guard of a train has been left behind, occasionally occur, and sometimes have their amusing aspects, though the delays which may arise are not welcomed either by the staff or by passengers, and they create difficulties. As a rule, however, this occurs through some interference with the guard as the right-away signal is given, or by his endeavouring to save a passenger from getting into trouble. The instance you mention, however, is somewhat interesting, in that a passenger obstructed the guard with the idea that he himself should not be left behind, and that the train waited while the guard, "a somewhat corpulent gentleman, aged 61," walked down the line a distance of nearly 2½ miles to the place where the train had been pulled up to wait for him.

[Reply to J. G. F. H.]

Midland Railway Locomotives.

Midland locomotives are classified to take various loads, above which pilot assistance is taken. Frequently, however, a pilot is not available and a heavy load has to be taken unaided, in which case drivers may, no doubt, experience difficulty in maintaining scheduled time. The general policy of this company has been for many years that of keeping trains to reasonable loads within the capacities of the relatively small 4-4-0 engines available, in preference to building larger locomotives, which would frequently work considerably below their capabilities. There is also the question of engineering restrictions on certain sections, seeing that the engines may be required to cover a large variety of routes.

[Reply to E. G. BATES.]

Railway Grouping.

You are not the only one who would like to have seen a Midland group in addition to the two great groups which are to divide the northern railway systems

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between them. At the same time, this matter is settled and no good purpose can be served by discussing alternative systems. The grouping which is now being carried out necessarily involves many anomalies, but that is due to the fact that railways are taken as they are without any attempt to transfer portions which apparently would be more suitably placed in other groups. Possibly a degree of re-arrangement may be carried out in the future between the grouped companies.

[Reply to J. M. MORISON.]

Metropolitan and Great Central Joint Line.

This line is managed by the respective companies in alternate five-year periods, and whichever company is in management deals also with the local goods traffic. Through goods trains from the Great Central line from north of Quainton Road for Marylebone may be sent either via the Great Western and Great Central joint line, or via the Metropolitan and Great Central joint line, no change being made in regard to through traffic arrangements over the latter, whether the management is in the hands of the Great Central or the Metropolitan Company.

[Reply to F. HARLING COMYNS.]

Snifting Valves.

Apparently you refer to the snifting and release valves placed behind the funnels of many Great Eastern Railway locomotives, especially those fitted with superheating apparatus. Similar valves (though sometimes one only is used) are also fitted by many other railways. These have already been explained. Their purpose is for admitting air to the cylinders when running with steam shut off and to operate in conjunction with the superheating apparatus for the escape of steam allowed to circulate through the superheater when the regulator is closed, as is now frequently the practice.

[Reply to B. PIRRIE.]

The Great Eastern Railway and St. Pancras.

For the first time since the war a through express between St. Pancras and Hunstanton will run daily during the summer season, in each direction. There is no indication or likelihood for the present, however, of a resumption of the daily all-the-year-round Great Eastern Railway expresses to and from this West End terminus. We have no information in regard to the other rumour you mention, which is highly improbable.

[Reply to "G.E.R. ENTHUSIAST."]

New Rolling-stock, London and South Western Railway.

A number of new restaurant and light refreshment car sets are being placed in service on the London and South Western Railway for West of England as well as for Bournemouth route trains, and we are not surprised to hear that one of them was noted by you on the Portsmouth route. It may, however, have been only a set of existing vehicles painted in the new colours. Your remarks concerning superheated 4-4-0 engine No. 314 are noted.

[Reply to W. THOMPSON CLARKE.]

North Eastern "Atlantics."

Both statements are correct. The ten "V" class engines, with 20-in. cylinders were the first series built, and the 19½ in. type followed some years later, and was classed "V 1" (numbers 696 to 705 inclusive). At a subsequent date, however, the latter ten engines were re-classified as "V," so that all twenty 2-cylinder "Atlantics" on the North Eastern Railway now have a uniform classification, despite a slight variation in type.

[Reply to W. J. C.]

Great Western Railway 2-8-0 No. 4700.

We have not heard of this engine working over the North main line; further, it has the usual green livery, and is not painted black. Others are now in service, and these may appear on various parts of the system.

[Reply to R. A. J. MACEY.]

Great Central Railway Locomotive Names.

4-4-0 No. 437 *Charles Stuart Wortley* was re-named *Prince George* when one of the new 4-cylinder 4-6-0 express engines received the name *Stuart of Wortley*.

[Reply to G. BYFORD.]

Smallest Railway in the World.

Your enquiry is capable of several replies. The smallest public railway, so far as the scale of engines, rolling-stock, &c., is the Eskdale, but for length of line this distinction probably applies to the Easingwold Railway, which has a total length of 2 miles 37 chains and is worked

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by one engine and three passenger train vehicles. Goods wagons required are, we understand, supplied by the North Eastern Railway.

[Reply to T. W. LINSELL.]

Steepest Main Line Gradients.

This distinction undoubtedly belongs to the Lickey incline, west to north main line of the Midland Railway, two miles at 1 in 37. Needless to say, practically all trains have to be banked on this section, for which the four-cylinder 0-10-0 tender engine No. 2290 was specially built. A view of this engine was given in the June RAILWAY MAGAZINE, while an illustration in the July number showed a train being banked on this section by two 0-6-0 tank engines.

[Reply to T. W. LINSELL.]

Junctions at Rutherglen, Caledonian Railway.

At the East or Carlisle end the signal box is named Dalmarnock Junction; at the West or Central (High Level) end the junction is controlled by Rutherglen station box, and at the North end of the triangle, towards Central (Low Level) the box at the end of the platforms is Rutherglen North, but the actual junction is controlled by Clyde Bridge Junction Box, ¼-mile further on.

[Reply to CHARLES SCOTT.]

E.V. Ry. Wagons.

We are informed by the Mineral Manager of the Great Northern Railway that the wagons you have noticed bearing the letters "E.V. Ry." are colliery-owned coal wagons, the lettering referring to the Erewash Valley line in the Nottinghamshire district. The collieries would probably be Mapperley or Digby, situated on the old Erewash Valley Railway.

[Reply to T. W. SNASHALL.]

"Cosmopolitan" Railway Stations.

Mr. Norman Thompson, of Winnipeg, writes in reference to the reply previously given, and to remarks to American "Union" stations, that nine separate railways, including both engines and cars, use the St. Paul "Union" depôt; that at Kansas City is used by about 12, at St. Louis by 20, and at Peoria, Illinois, by 11 railways.

[Further reply to T. W. LINSELL.]

Great Western Railway Locomotive History.

Referring to the reply given in the June RAILWAY MAGAZINE, Mr. L. B. Hewitt, of Bath, mentions that the pioneer 4-6-0 engine, No. 36, was not rebuilt and was scrapped some years ago. This engine was designed for goods traffic, and was illustrated in the first number of the RAILWAY MAGAZINE (July, 1897).

[Further reply to H. G. C.]

Goods Traffic Exchange.

We are informed by Mr. J. Rostern, Chief Goods Manager, Great Central Railway, that his company usually exchange traffic with the South Eastern and Chatham Railway, via Banbury, Great Western Railway and Reading (or Stewart's Lane Battersea), and with the London, Brighton and South Coast Railway, via Banbury Great Western Railway and Kensington.

[Reply to J. H. H.]

Smokebox Doors.

Various methods are adopted for keeping smokebox doors closed in an airtight manner, a necessity for efficient working, and the dogs which you have noted on London and South Western Railway locomotives represent the method of securing the doors now employed on that line.

[Reply to W. JAMES.]

Joint Railways and Grouping.

No statement has yet been made as to the position of joint railways involving the interests of more than one group. Presumably they will be carried on under the direction of joint committees. Joint lines which come wholly within a group will, of course, disappear entirely as separate organisations.

[Reply to G. B. D.]

Great Central Railway in Liverpool.

Great Central trains are worked into Liverpool Central station by virtue of the fact that the Great Central Railway is part owner of the Cheshire Lines Committee's railway. The Great Central Railway also provides engines for working Cheshire Lines trains.

[Reply to "SIGNAL BOX."]

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Heavy Passenger Train-Loads.

Sixteen Great Western Railway corridor coaches, even if of 70-ft. stock and crammed to capacity, would not be likely to scale more than 600 tons at most. Trains up to and exceeding this weight were worked single-headed on the Great Northern Railway during the recent coal dispute period; see last September issue.

[Reply to HUBERT RANKIN.]

County Class 4-4-0's, Great Wesernt Railway.

There are sufficient of the large 4-6-0 engines to work all the principal passenger trains, and the services of the "Counties" are therefore seldom required for the heaviest duties. We have not the space to reply to more than two queries from one reader in any one issue.

[Reply to HUBERT RANKIN.]

Pullman Cars, South Eastern and Chatham Railway.

When a sufficient number of these cars are available, the use of them could be extended to the Hastings branch. The American Car trains ceased to run about the beginning of the war, and most of these cars have now been converted to Pullmans.

[Reply to "DOME."]

Signals at Clapton Junction, Great Eastern Railway.

It is becoming increasingly the practice at diverging junctions to "step" the signals in such a way that the higher arm refers to the straight road, and the lower to the diverging road, irrespective of their relative importance. This practice has been followed at Clapton Junction.

[Reply to "MOGUL."]

Leeds-Glasgow Dining Cars, North Eastern Railway.

Restaurant cars on the 8.55 a.m. from Leeds to Glasgow were restored between Newcastle and Glasgow in October, 1920, and throughout from Leeds in October, 1921. There were no restaurant cars whatever running on the North Eastern Railway early in 1918.

[Reply to HUGH STONE.]

Metropolitan District Railway Electrification.

Experiments were first made in 1900 with an electric train which ran between Earl's Court and High Street, Kensington. On November 5, 1905, all steam trains on the Metropolitan District line were withdrawn and electric working became general.

[Reply to R. C. H.]

Akeman Street, Great Central Railway.

Certainly the travelling facilities offered here are exceptionally small, but the demand is probably the same, and in any case we hardly can agree with you as to the route concerned carrying a "dense" traffic; on the contrary, passenger trains over this section are particularly few and far between. [Reply to "BARUM."]

Railway Records.

"The fastest train ever run in the world, what railway and what speed and what name or number of engine" is too controversial for these columns. The heaviest tender engine in England is the new Great Northern Railway 4-6-2 No. 1470, weighing with tender 148 tons.

[Reply to A. J. BLANCHET.]

Train Frequency.

The Metropolitan District and Metropolitan Railways both operate 40 trains per hour on each line through the busiest sections during the hours of travel pressure, but we cannot say whether these records are exceeded by the Interborough Subway in New York.

[Reply to T. W. LINSELL.]

"Engineer" Locomotives London and North Western Railway.

These are old engines used by the District Engineers for their inspection journeys. See page 89 of Mr. C. Williams's *Register of London and North Western Railway Locomotives*, of which particulars appear in our advertising pages.

[Reply to R. B. and M. B.]

No. 1987 "Glendower," London and North Western Railway.

This is an "Experiment" class 4-6-0 locomotive, and is, therefore, not superheated. See Mr. C. Williams' *Register of London and North Western Railway Locomotives*, of which particulars appear in the advertising pages.

[Reply to "CLAN STEUART."]

Coasting Marks, London and South Western Railway.

The white diamonds mounted upon short posts which you have noticed on electrified sections of the London and

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South Western Railway are coasting marks indicating to drivers of electric trains where to shut off current.

[Reply to F.H.V.P.]

No. 4000, "North Star," Great Western Railway.

This engine, first built as a four-cylinder 4-4-2 and numbered 40, had, and we believe still has, a special valve gear, in which the valves are operated by combining the movements of the two inside cylinder crossheads by means of a system of levers.

[Reply to "STAFFORD ROAD."]

12 Noon Torquay Express, Great Western Railway.

When this train is running non-stop from Paddington to Torquay, engines must be changed at Torquay, as the large 4-6-0 engines are precluded from running between Torquay and Kingswear owing to weight.

[Reply to "WICKET."]

Maximum Speeds on "Cornish Riviera" Express.

These vary from day to day according to load, driver, weather conditions, &c. Speeds in excess of 80 m.p.h. are attained at times. See Mr. Cecil J. Allen's article in December, 1921, which describes a notable run with this train.

[Reply to G.M.H.]

Metropolitan Railway Locomotives.

The cylindrical tank you noticed on Metropolitan 4-4-0 tank engine No. 22 was used in conjunction with the oil fuel installation fitted to this engine. This apparatus is now out of commission, but the cylinder has not been removed.

[Reply to G. BYFORD.]

Turbo-Electric Locomotives.

The Ramsay turbo-electric locomotive was described in the May RAILWAY MAGAZINE. We are not aware that the results of trials with the previous Ramsay locomotive, built about 1912, have ever been made public.

[Reply to C. G. CHITTENDEN.]

Concrete Signal Posts.

Presumably, in specifying posts which are "pigeon-holed," you are referring to the concrete posts of which a number are now in use. The main purpose is, we believe, to reduce the weight of material, as there is no need to make the post solid.

[Reply to F. D. LYS.]

Royal Trains.

We understand that rebuilt 4-4-0 engine No. 160 worked the royal train to Dover on the occasion of the recent visit of the King and Queen to Belgium. The South Eastern and Chatham Royal train was no doubt employed as usual.

[Reply to R. STRINGER.]

Signal Display Boards.

When the arm of a signal is in such a position as to be seen with difficulty against the background by the drivers of approaching trains, a white display board is frequently fixed behind it, in order to throw it into relief.

[Reply to "PEACOCK."]

London and Weymouth Routes.

Distance by London and South Western Railway from Waterloo *via* Poole, is 142·8 miles, and by the Great Western Railway *via* Savernake 154·6 miles. There is not much to choose between the two in the matter of grading.

[Reply to G. W. GREEN.]

Riviera" *v.* Scotch Expresses.

On the basis of average running speed, the Great Western Railway "Riviera" express is a much faster train than any of the Anglo-Scotch expresses, especially over the three-quarters of the journey between London and Exeter.

[Reply to W. DAVID PORTER.]

Perranporth Station.

This is a station of island platform type situated on an embankment. The station illustrated in the second picture mentioned by you was entitled "Perranporth" in mistake for "Perranwell," on the Falmouth branch.

[Reply to "CYPRUS."]

Birmingham-Bristol Non-stop.

This run was made daily by the Midland Railway in certain of the earlier years in the present century, prior to the opening of the Great Western Railway route via Stratford-on-Avon. See "Voyageur's" article on Train Services in the June issue.

[Reply to "CANTAB."]

Cost of Express Locomotive Running.

An average of about 400 lb. of water and a little under 40 lb. of coal would be consumed per mile covered by the engine of

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the "Riviera" express on the journey from Paddington to Plymouth. Your second query is incomprehensible.

[Reply to K. D. SALOP.]

Engine Springs.

We cannot see how the breakage of an engine spring is likely to affect directly the working of the cylinder pistons in any way, although the breakage referred to is of itself quite sufficient to put the engine out of commission.

[Reply to E. V. ARDRON.]

Wednesbury-Darlaston Curve.

This line, extending from Wednesbury No. 2 Box to Darlaston Junction via Fallings Heath, is now treated as sidings, so far as the centre section is concerned, and as a goods line for the remainder, no passenger trains being worked over it.

[Reply to "CYPRUS."]

Camp Hill Route, Birmingham, Midland Railway.

In summer the Manchester-Bournemouth through express *via* Crewe, Birmingham and Bath travels by the Camp Hill route. This route has no connection whatever with the London and North Western Railway. [Reply to "CROUCH HILL."]

Kenilworth-Berkswell Direct Line, London and North Western Railway.

Used daily by the 8.0 and 8.45 a.m. passenger trains from Leamington to Birmingham, and the 5.29 and 6.53 p.m. from Birmingham to Leamington, also by certain goods trains.

[Reply to J. F. READE.]

Reading Central Station, Great Western Railway.

This is a goods station in the centre of the town, reached by a branch line $1\frac{3}{4}$ miles long from Coley Branch Junction, between Reading West and Southcote Junction, on the Westbury main line.

[Reply to L. BICKER.]

Midland and South Western Junction Railway.

Both locomotives and rolling-stock on this railway are painted in crimson lake. For information of this character, please see the RAILWAY YEAR BOOK, of which the 1922 edition is on sale.

[Reply to "BRASS DOME."]

London and South Western Railway Locomotives.

The present light green colour was adopted under Mr. Adams. Please see Mr. Ahrons' articles dealing with the history of the locomotives of this line during the latter part of the 19th century.

[Reply to F. HORDER.]

New Rolling-Stock, London and South Western Railway.

We understand that a number of new trains are being constructed for the principal services, and no doubt, some of these will appear on the West of England routes in due course.

[Reply to F. HORDER.]

Height of Locomotive Boilers.

A moment's thought should convince you that the varying heights or "pitch" of locomotive boilers above rail cannot have the slightest influence on their relative capacities for speed.

[Reply to F. P. MILLARD.]

Track Signs.

Presumably, the signs you have noted are those adopted on some lines to indicate commencement (C), termination (T), and speed allowed in miles per hour (15), while sections of track are under repair.

[Reply to A. M. GUNN.]

Midland Railway Tank Engine No. 1207.

This engine was described and illustrated in Mr. Ahrons' articles appearing in the RAILWAY MAGAZINE for July, 1919, pages 36 and 37. The series originally numbered 780 to 799 became 1206 to 1225. [Reply to E. B. SOWRY.]

Australian Commonwealth Railways.

The standard brake equipment used on the Australian Commonwealth Railways, Trans-Continental section, is the Westinghouse. Your correction to this effect is, therefore, noted.

[Reply to W. T. HOECKER.]

"S.M.J.R."

"South Midland Railway," in the answer to H. Kirkby, in April, was a printer's error for "Stratford-on-Avon and Midland Junction Railway," above initials being misinterpreted.

[Reply to J. V. HALL.

Longest Through Journeys.

Trains from London to Inverness and Aberdeen represent the longest through train journeys in the British Isles, though the Penzance–Aberdeen through coach covers a greater mileage.

[Reply to T. W. LINSELL.]

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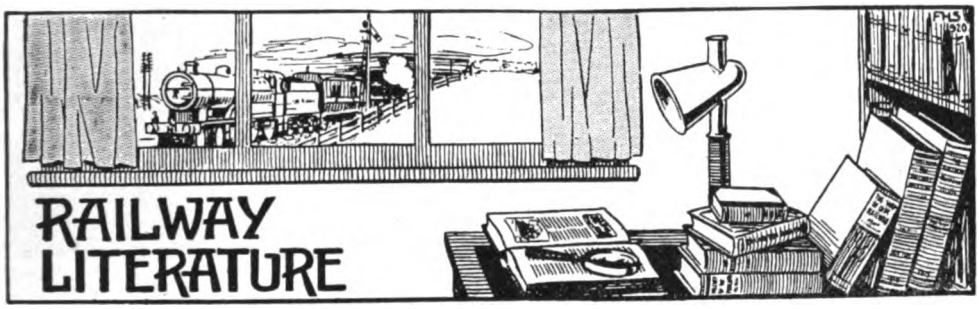

SOUTH AFRICAN RAILWAYS AND HARBOURS MAGAZINE, ELECTRIFICATION NUMBER, MAY, 1922. Price 2s. 6d.

This issue of our contemporary constitutes a notable publication, both in regard to the literary contents and the wide selection and interest of the illustrations. Portraits of chief officers of the South African Railways and South African notabilities are included. The General Manager, Sir William Hoy, C.B., contributes an introductory article indicating how the need for electrification has arisen. Mr. C. H. Merz, the well-known electrical engineer, deals with the more technical features of electrification, with particular reference to the Glencoe-Maritzburg section. Other articles deal with electricity supply in South Africa for general purposes and for railway traction, the relation between railway electrification and industrial development, the engineering aspects of the route between Maritzburg and Glencoe, and the general subject of main line railway electrification, together with other contributions, some dealing with various aspects of railway electrification, others with traffic aspects, such as power and automatic signalling, the early history of South African railways, transport conditions and methods in South Africa, train lighting, &c., together with a few articles of a tourist and general character. Special reference may be made to a summary of the world's progress in railway electrification by Mr. G. E. Chittenden, particularly in view of the tables appended to the article. Copies can be had on application to the London offices of the Union in Trafalgar Square.

THE RAILWAY AND LOCOMOTIVE HISTORICAL SOCIETY. BULLETIN No. 3.

Mr. C. E. Fisher, of 152, Harvard Street, Suite 8, Brookline, Mass., U.S.A., sends a copy of this, the third bulletin issued by the Society. It indicates that United States readers have a wealth of material of historical interest to them in regard to their railways, just as we have in reference to British railways. Thus, the bulletin includes an article telling the "Story of the Old Woburn Branch Railroad"; others on "Single Driving Wheel Locomotives," "Some Famous Runs and Some Famous Engines," and "The Maine Central Railroad and its Leased Lines," together with various contributions of an interesting character. The bulletin is well illustrated and we suggest that some of our readers may care to communicate with Mr. Fisher in regard to purchasing copies of this and the two preceding bulletins, though in sending the publication to us, he has not informed us (and there is no indication) as to the price at which copies can be supplied to non-members of the Society. Mr. Fisher asks us to mention that membership of the Railway and Locomotive Historical Society is not confined to the United States. They would welcome members from England or other countries where the RAILWAY MAGAZINE circulates.

INSTITUTION OF RAILWAY SIGNAL ENGINEERS.—We have received from Mr. M. G. Tweedie, A.M.I.E.E. (Great Western Railway Signal Department, 80, Caversham Road, Reading), Hon. General Secretary, a copy of the volume of Proceedings for the 1921 Session, including list of officers and members and the annual report. It is introduced by portraits of Mr. C. H. Ellison, President, 1921 Session, and Messrs. A. T. Blackall and J. Sayers, Past Presidents. The report shows that on December 31, 1921, the Institution had a total of 370 members. A satisfactory financial position is indicated, and the report as a whole is favourable. The volume of Proceedings includes a large number of useful papers presented at meetings of the Institution, together with the discussions thereon. The price of the volume to non-members is 7s. 6d.

THE INDUSTRIAL YEAR BOOK, 1922. Edited by Philip Gee. [Published at 40, King Street, Covent Garden, W.C. 2. Price 36s.]

Bound in red cloth, 10 × 7½ in., and containing 1,086 pages, this volume is weighty in more ways than one. It contains papers and notes by the Rt. Hon. Sir Robert Horne, M.P., Chancellor of the Exchequer; the Rt. Hon. T. J. Macnamara, M.P., Minister of Labour; Viscount Burnham,

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Lord Askwith, the Rt. Hon. J. H. Whitley, M.P., Speaker of the House of Commons; Col. O. C. Armstrong, President of the Federation of British Industries; Harold Cox, Edouard Luboff, and many others. The subjects cover a wide range, including agriculture, shipping, transport, mining, engineering, chemicals, leather, building, insurance, overseas trade, trade unions, the co-operative movement, employers' associations, and a host of others.

Although the reader is requested not to restrict his study to the one or two subjects in which he is particularly interested, it is only natural he should turn first to them. The RAILWAY MAGAZINE reader, on referring to "Transport," will find that railways are given their proper premier position. The articles include (1) general information and statistics relating to railways in the United Kingdom; the world's mileage; accidents on railways. (2) The effect of the Railways Act, 1921, on the grouping, working, and powers of charge of British railways; how the Act affects rates for transport of goods and passengers; what powers the Act confers upon traders to raise objections to any charges. (3) Labour and railways.

Under the heading "Canals and Railways," we are pleased to note that the records are historically correct, instead of being the usual misleading statements concerning the relations of these two means of transport.

From a chapter on "Articles of Drink" we cull the following concerning railway refreshment rooms:—"The maximum amount of duty payable in respect of a retailer's on-licence granted for premises used as a refreshment room at a railway station is £50."

The aim of "The Industrial Year Book" is to fill a gap in trade literature and embody within one pair of covers. the salient facts and essential figures of British economic activity throughout its whole range. In its compilation extensive use has been made of Government publications, and acknowledgment is made of the help received from the English representatives of the Overseas Governments, and from the many foreign correspondents who have supplied information with respect to economic and labour conditions in foreign countries. Altogether it is an excellent work of reference and a copy on the bookshelf will save much laborious research in other directions.

THE RAILWAY YEAR BOOK.

Railwaymen and business men will do well to obtain a copy of the "Railway Year Book for 1922." It is published at the offices of the "Railway Magazine," 33, Tothill Street, Westminster, S.W.1. There is a wealth of information about all the railways in the British Empire, giving mileage, earnings, profits and other details. The personnel is included, and the reading matter about the railways is served up in a most interesting manner, particularly the history of the different lines. There is a "Who's Who" of everybody of note in the railway world, maps of all the systems, and pages of statistics. Legislation dealing with railways and the new Railway Act form important features. As the price is only five shillings, it should be found in our libraries and railway institutes.—*The Natal Mercury.*

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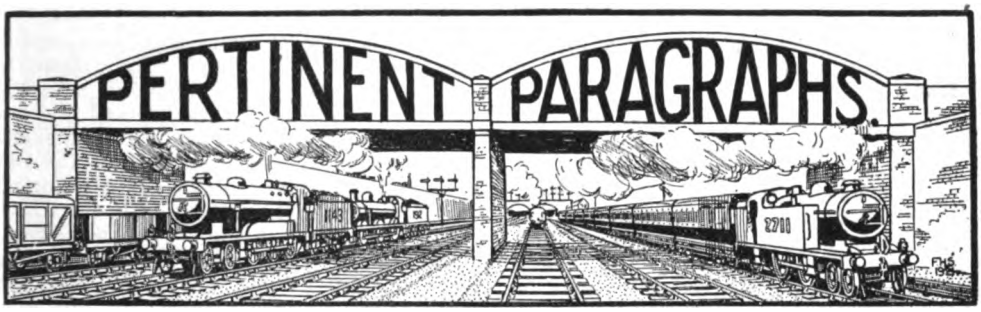

Railway Working which would not satisfy the Board of Trade.

In the course of a paper read recently before the Institution of Railway Signal Engineers by Mr. W. S. Roberts, of the London and North Western Railway, on "Some Recent Developments of Token Working on Single-Line Railways," he quoted instances indicating the difficulties which arise where men of the less highly developed nationalities have to deal with the working of trains. As an example, Mr. Roberts mentions the following instance: "Some years ago, I was in a traffic manager's office of one of the South American railways, and the traffic manager was worrying over a report he had received and which he asked me to peruse. Briefly the report was that two goods trains travelling in opposite directions had met in the middle of a section of single line, fortunately without damage, as the sight each way was a good one. After argument, one had to return to give way to the other. The explanation of this was that each of the stationmasters had finished duty for the night after the trains were despatched, and whichever train arrived first, the particular stationmaster went off. They disagreed as to which train should be sent forward, with the result that both were despatched. He asked me could I provide the remedy, and my reply was to involve the drivers as well as the stationmasters by installing token instruments, which obviously were not there when the occurrence happened. The remedy was applied. It is very unlikely that such an incident as this would occur in this country, and if perchance it did, it would be very drastically dealt with."

That even British railwaymen are not entirely free from irregular practices is shown by the following: A fog-man was stationed at a signal and a detonator was on the line—the usual fog-hut with a fire in a brazier at the entrance. Inside, the fog-man in the "arms of Morpheus," with a string tied to his leg, the other end being secured to the wire connection operating this particular signal—the logic of the fog-man evidently being that, if the arm was pulled off, he would waken up to remove the detonator by having his leg pulled in a practical manner, or otherwise he would be aroused from his slumbers by the explosion of the detonator, which he could then renew, and continue his sleep until disturbed again.

Standardising Single Line Workings.

Referring to methods designed to prevent a recurrence of accidents such as that at Abermule, including suggestions for differently coloured tokens or distinctive tokens, and correspondingly differently designed instruments provided alternately, Mr. Roberts emphasises the difficulty and confusion which might be caused by the operating staff at one station having to handle two entirely different types of instruments: maintenance men would require the technical knowledge of two distinct types of instruments; and separate stocks of spares would have to be held. He goes on by remarking that the best approach which has come to his knowledge of this arrangement is the provision of the electric train staff for one section, and a combination electric train staff and tablet for the adjoining section. This is a standard existing on several of the most important Chinese railways. There is no doubt that distinctive tokens would offer a safeguard, especially at night, when the token might be misread. The above method provides the distinction required, overcomes the three objections enumerated—as no difference is made in the design of the instruments—and removes the disadvantages of exchanging tokens at speed which would otherwise exist by alternating with staff and tablet instruments.

Mr. Roberts advocates the method of controlling the starting or advanced starting signals by means of the tokens. The paper also deals with special developments of token working, including arrangements for balancing tokens where there is an excess of traffic in one direction, and special switching-out systems to enable composite sections to be operated as one long section when traffic will permit, as on Sundays and during the night. The latter has already been referred to in "Pertinent Paragraphs" in the February Railway Magazine.

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Locomotive and Train Working in the latter part of the 19th Century.—The Cambrian Railways.

ARISING out of Mr. Ahrons' articles, Lieut. H. Tudor Williams, R.N.R., refers to the 1885–8 period mentioned by Mr. Ahrons, at which time he was a schoolboy, living at Caersws, a station one mile north of Moat Lane Junction. He mentions that at that time the 0–6–0 goods engines were just having weatherboards added, and he recalls seeing the engine *Tubal Cain* with and without them. "From Moat Lane Junction to Llanidloes, a 5-ft. leading coupled used to run, and the driver, a Mr. Henry Watson, I always understood served his time under the great George Stephenson. He came from Newcastle and was afterwards made foreman at the engine sheds at Llanidloes. My father, who was well known at that time on the railway, thought the world of Watson as being such a 'safe' driver to ride behind. I suppose this safe travelling being, what shall I say, 20 m.p.h.! I know one story Watson told. He was driving the Duke of Wellington, and Watson or the fireman, happening to look back along the train, saw the Duke's head out of the window, shaking his fist. The speed was too fast for the Iron Duke. I rather think he would be using his own carriage, which was placed on a truck, as was done sometimes, was it not?"

Lieut. Williams then refers to two engines which Mr. Ahrons did not describe. "About 1886 two new express engines came along and caused us boys much excitement. Their names were *Lord Beaconsfield* and, I think, *Marquis of Hartington*. They had four-wheeled bogies and two driving wheels coupled, and were the only ones I remember so, for the other passenger engines were the 2–4–0. They used to run on the 'fast' (!) train leaving Moat Lane about 4.0 or a little before, and not stopping till they got to Machynlleth. This was the only train that had a carriage from the London and North Western from London, and I suppose was attached at Welshpool. After this 'Rapide' had gone by, there was a mixed train which had two carriages and a goods brake at the end of some 20 or 30 wagons and trucks, and used to do the mile to Caersws in eight minutes."

In regard to the Van Railway, Lieut. Williams writes: "You mention the Van branch. The stationmaster was a Mr. C. Hughes. I don't think any tickets were used when anyone travelled on the line, which was supposed to be not very safe. I can certainly remember the rails looking very frail. This stationmaster was somewhat of a poet, and is said to have been the author of 'God Bless the Prince of Wales.' He was a bard of some note, and outside the house that he lived in is a stone memorial which has been put up by public subscription. The line was then worked by two (I think saddle-tank) locomotives; driver a Mr. Aldridge, and quite a genius in the way of making wooden models of his engine. He used to case in his cab during the winter and we used to call him 'Jack-in-the-box.' I saw one of these old engines which had been bought by the Cambrian and was shedded at Moat Lane. I am not sure if it is not now working the Abermule branch to Kerry."

The Automatic Train Control Committee.

THIS Committee was appointed by the Minister of Transport in October, 1920, to enumerate the possible functions of automatic train control, to examine devices under trial, and to form conclusions on its adoption. The Committee point out that the following features in the working conditions, equipment and methods of block signalling in Great Britain must be allowed for in considering the expediency of automatic train control:—(*a*) the dissimilarity in brake power of trains; (*b*) the speed maxima, which vary between 20 and 80 miles per hour; (*c*) the fact that the standard block interval has been fixed without any regard to speed or gradient; (*d*) the liability of fog, falling snow, &c.; (*e*) the high frequency and complex character of traffic; (*f*) the number of lines jointly used by different railway companies; (*g*) existing variations in structural and load gauges. "The introduction or extension of any system of control could not be recommended unless a standard in respect of track and locomotive apparatus be first decided upon, which would enable the desired effects to be produced upon all locomotives, whether working on home or foreign lines."

Summary of Recommendations.

THE Committee find that there is a *prima facie* case for automatic train control upon British railways, as the only means for obtaining greater security against the class of train accident which in general results from failure on the part of enginemen. The method of automatic train control most likely to suit existing conditions on British railways should supplement rather than replace existing block telegraph and signalling systems, and comprise (*a*) automatic train-stop, located at or near selected stop signals, which shall, in the event of a train passing such signals, when they indicate danger, bring the train to a standstill; (*b*) automatic warning control at distant signals, and at such other places where danger from too high a speed may be anticipated.

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On the lines of these conclusions the Committee have drawn up a series of requisites with which any acceptable system of automatic train control should in their opinion generally comply.

The Committee are of opinion that a case for the adoption of automatic train control upon single lines where token working is in force has not been established, although there may be a few cases where eventually control may be found desirable. Lines used purely for goods or mineral traffic also do not as a general rule call for the adoption of automatic train control. The estimated cost for the full scheme on passenger routes, upon which there are two or more lines in existence is :—

First cost	.. ..	£4,660,000
Annual charge	..	407,000

Possible reductions in these figures are referred to in the Report. In a résumé of their conclusions, the Committee recommend the gradual adoption of control in accordance with the list of requisites given, and that if, owing to financial considerations, the complete scheme cannot at once be entertained, the first step should be the introduction of control at selected stop signals. They also recommend the immediate formation by the railway companies of a committee of experts to determine and standardise track and locomotive apparatus, having regard to differences in structural and loading gauges and the position of conductor rails on electrified railways.

Irish Railway Notes.

INFORMATION concerning developments on Irish railways are not readily available, and the following notes, sent in by Mr. H. W. Lea, will no doubt be of interest :—In April last the Dublin and South Eastern Railway put into operation a greatly augmented suburban train service in conjunction with reduced fares and the abolition of the second class on all trains, three coach trains being run to and from Dalkey at intervals of 15 minutes, stopping at all stations, with an hourly service to Bray. In addition, during the morning and evening rush hours, some of the Bray and Greystones trains run non stop between Westland Row and Kingstown. The pre-war Westland Row-Dalkey non-stop run was restored by one Greystones express in each direction.

The latter trains proved very popular from the start. Made up of four bogie coaches with a couple of six-wheelers frequently added, and hauled by one or other of the 4–4–2 tanks No. 20 and Nos. 52 and 54, they usually gained on the booked time of 15 minutes, the best times recorded by the writer being 12 minutes 15 seconds, and 12 minutes 20 seconds by Nos. 20 and 54 respectively, though even these are stated to have been improved upon despite the crawl through Kingstown station and the severe up gradient from there to Dalkey. The enterprise shown by the company has proved most successful, and to meet the steadily increasing traffic it has been found necessary still further to augment the service from the beginning of June to a half-hourly service, some semi-expresses being instituted to and from Bray on Saturdays and Sundays in addition to the local service to Dalkey. Unfortunately the June alterations have resulted in the abolition of the Westland Row-Dalkey non-stop runs, a Kingstown stop having been inserted and an extra 2 minutes added to the time to Dalkey, which seems quite unnecessary, since even with the extra stop a booking of 15 minutes was well within the capabilities of No. 20, &c. The time-keeping has been remarkably good since the inauguration of the new service, and though the train loads are light, the performances of the various D.S.E. tank engines (2–4–0, 2–4–2 and 4–4–2) are extremely interesting.

The Sydney Metropolitan and City Railway Electrification.

WE are indebted to Mr. A. A. Bowles, of the office of the Engineer-in-Chief, New South Wales Government Railways, Bridge Street, Sydney, N.S.W., for the following particulars: On Monday, February 20, 1922, work was resumed on the construction of the city section of the Sydney Metropolitan Railway. Two Resident Engineers, Mr. A. Humphries and Mr. K. Fraser, were recently appointed to supervise the work, under the control of Mr. J. J. C. Bradfield (M.I.C.E.) Chief Engineer for Metropolitan Railway Construction. The excavations for Hyde Park station were commenced, as it is intended to open this section before the completion of the whole work. The line will form a loop around the city from Sydney Central station to Hyde Park (at corner of Liverpool and Elizabeth Streets)—St. James—Ciraila Quay, —Wynyard Square—Town Hall, and rejoining the loop midway between Hyde Park and Central Station. The line will be similar to the Metropolitan Railway of London as it will be just under the surface except where it is necessary to avoid foundations. Hyde Park station will be wholly excavated from the surface, but on completion it will be covered over and the Park gardens and lawns will be restored. The excavated earth is being carted to the upper end of Darling Harbour and tipped, as the harbour is to be filled in down as far as the Market Street or Ryemont Bridge.

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Thus, as the work progresses, a number of shipping companies will be compelled to find new quarters. The existing railway wharf arrangements are being gradually removed to new quarters out on the main harbour, so as not to interrupt transhipping of merchandise, &c. A new station will be erected on the park adjoining the Central Terminus, and the terminating roads at platforms 16, 17, 18 and 19, will be extended through it, without disturbing existing traffic arrangements. Belmore Park, immediately in front of the Central Terminal, will be crossed on an imposing and neat viaduct, to be erected adjacent to Elizabeth Street. The line will enter the ground at a point about midway to Hyde Park—the natural surface, rising steeply, being favourable for the underground working without introducing severe grades. This point will also be the junction of the two ends of the inner circle. A portion of the tunnel, from the eastern end of Circular Quay to a point under the Domain, was constructed recently, and work will be resumed on this portion at a later date. Circular Quay station will be an exchange station for railway, tramway and ferry traffic. It will be constructed along the Circular Quay with the railway platform overhead. and the ferry wharves, about 12 in all, below the street level, while two tramway systems have their terminus in the street alongside.

New High Level Bridge.

The scheme provides for the construction of a high level bridge connecting the northern side of the harbour with the city. This will give continuous connection from the north shore line to the city railway, which it will join between Wynyard Square and Town Hall stations, the former being a two-level station, similar to Charing Cross Underground station, London. Connections will eventually be made from the Inner Circle to both eastern and western suburbs, but the work of connecting St. James' station to the central terminal will be pushed ahead as rapidly as possible—the surface tramways being overloaded and congested. It is estimated that Wynyard Square will be the busiest station on the circle and provision has been made for future expansion. The new electric station adjoining the Central terminus will be a separate structure, although physical connection will be made for interchange of passenger traffic. As the trains will give service to all of the existing suburban systems there will not be a heavy interchange traffic, at Sydney, and possibly country passengers will change at Strathfield—about 7 miles out—instead of proceeding to the terminus. The resumption of work will provide employment for a number of unskilled workers and will help to lessen the unemployment. Most of the suburban track widening has been completed, and several sets of the new type suburban carriage trains are in use on the North Shore and Bankstown lines. These trains will be equipped with electric equipment on completion of the electrification works, but they will be used on steam services to relieve the shortage of suburban rolling-stock.

Electric Traction on the Swiss Federal Railways.

THE readers of the RAILWAY MAGAZINE are familiar with the gradual electrification of the Swiss Federal Railways V Division, known best as the Gotthard Railway, and therefore the following particulars of a very excellent run furnished by Mr. E. J. Miller, will be of interest. The locomotive was one of the new "high speed" electric locomotives. The quickest run as yet accomplished in Switzerland was made on the recent return of the King of the Belgians from Rome to Brussels. The special train was composed of four vehicles of the International Sleeping Car Company's type, and a "Heiz Wagen," 17 axles, 167 tons net, hauled by one electric locomotive. The "Heiz Wagen" or heating-carriage, which was attached to this special train throughout its Swiss journey is a carriage provided with a stove and boiler and attended to by a special employee for the purpose of increasing the hot water circulation when attached to a steam train, or for providing heat when worked in an electric train. These cars are necessary on the Alpine sections of the Swiss railways on account of the intense cold of the winter, which under normal conditions is very often below zero.

The speed of this train was above that of the special schedule arranged, as the train was delivered to the Swiss Federal Railways at Chiasso 31 minutes late by the Italian State Railways. The record run was made between Bellinzona and Erstfeld (109·3 kil.) 67·9 miles in 97 minutes, an average speed of (68·03 kil. per hour). 42·4 m.p.h., being better than the best regular run in Switzerland, viz: Geneva–Lausanne at 40·5 m.p.h., over undulating gradients of 1 in 100 or easier.

Of the 67·9 miles, over 40½ are on a continuous rising gradient, the first 15½ miles at 1 in 166, then 4 miles at 1 in 65, and the remainder at an average of 1 in 38. The 21¼ miles of descending grades are all at 1 in 40 or 1 in 39, while in the great Gotthard tunnel the gradient eases to 1 in 500. The total rise from Bellinzona to the Gotthard tunnel "summit" is 993 ft., and the descent thence to Erstfeld 740 ft. How meritorious

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is this run (for which 2 steam locomotives would have been required) will be clearly seen from the following comparison of times.

1914.	1921.	1922 (Special Train).
H. M. 2 26 (*a*)	H. M. 2 2 (*b*)	H. M. 1 52 (*b*) (*c*) 1 37 (*b*) (*d*)

(*a*) Start to *pass* including 3 regular stops.
(*b*) Non-stop.
(*c*) Scheduled.
(*d*) Actual.

most superficial, and although this remark is somewhat discounted by the formation in the United States of the International Locomotive Association and the Locomotive Historical Society, as mentioned in our pages recently, it is supported by comments published by our American contemporary, the *Railway Age*. A correspondent, in appealing for a better understanding between the railways and the public, and commenting upon the lack of public interest in railways, remarks as follows :—

" Years ago the people talked of railway items, but such is no longer the case. No one seems to care about train performance, or the performance of individual engines. Before

SPECIAL TRAIN FOR H.M. THE KING OF THE BELGIANS AT GUSCHENEN SWISS FEDERAL RAILWAYS.

Drawn by Electric Passenger Locomotive No. 12312.

Public Interest in Railways.

It is not easy to understand why there should be, in other lands, so little apparent non-technical interest in railways and their affairs, in view of the large numbers of people here who find so much that appeals to them in the study and observation of railway material and operation. This extends, too, much beyond the ordinary " boyish " interest, which evidences itself principally in the collection of engine names and numbers, and the accumulation of photographs of locomotives and trains, for a large proportion of our readers go much more deeply, and frequently are qualified to discuss even practical aspects of railway operation with a considerable degree of soundness and authority.

In other countries, however, there are few signs of corresponding interest other than the me I have a current English railway magazine [obviously the Railway Magazine—Ed. *R. M.*] full of such items. There are seven pages of replies to correspondents inquiring about the Midland coat-of-arms, locomotives on Isle of Wight, the largest station in the world, &c. All of this evidences the deep interest of the travelling public. Our lines have become highly standardised, but, nevertheless, there is much that might be told of daily interest. Clean engines should always appeal to the traveller and the naming of locomotives is not a matter to be considered as of no advertising value, especially of large passenger engines. Music is essential in the army ; so are the small items of the daily doings of the railways a real interest in their welfare. Tactics in the army and tons per mile on the railway are not for everybody.

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If one of the large systems were to paint an engine pink and send it over the system, the fact would get into all local papers and the line would be talked about in thousands of homes where ton-miles are unknown. This would not minimize the importance of study of train loads to those who are responsible for them. One recalls the Ghost train of the old New England road in this connection."

An American Reader on English Railways.

ON the same lines, Mr. Arthur Curran, an American reader, à propos of reference to an article in that journal dealt with in our "Pertinent Paragraphs," recently wrote to the *Sheffield Telegraph*. He said: "It has often occurred to me that the intelligent and widespread interest in railways so manifest in England is responsible for the admirable solution of the many difficulties that have arisen at various times. The English newspaper 'brings the railway home' to the people in a manner that is unknown in America. Over here, the financial statements may be of some assistance to shareholders, but they do not mean anything to the vast multitude that would be impressed by more intimate studies of railway management and practice . . . In America, the average man never hears of the railways unless there is an accident or a financial debacle. Not long ago, the illustrated supplement of a New York daily contained a picture of the recent derailment on the North Eastern Railway. No doubt, if some would-be contributor had offered the editor a photograph of a North Eastern Railway express moving in perfect order and with satisfaction to all concerned, it would have been declined without thanks. But when an accident occurs, the same editor condescends to interest himself even in an English railway."

American Relief Work and Russian Railways.

THE secretary of the American Relief Administration European Children's Fund sends particulars of the arrangements whereby food for famine sufferers sent from America to Russia during the first four months of 1922 is dealt with on arrival at Russian ports, its further transit to the interior being under the control of the Soviet Government.

All A.R.A. supplies are loaded on the Russian cars under American supervision. The cars are then sealed, and this seal may not be broken except in the presence of another A.R.A. official. Whereas once individual cars attached to passenger or freight trains were used for the transportation of the famine food, now in view of the heavy tonnage and the need for speed, solid trains are used. This is more satisfactory for two reasons. In the first place it is easier to keep track of a train than of an individual car. In the second a "major" or "capital" train of 30 or more cars has the right of way over all other traffic. On a long freight haul that might take a month for single cars, a saving of from 10 to 14 days is effected by using a solid train.

Usually A.R.A. supplies are shipped to the central warehouse at Moscow, and thence distributed to the various districts in accordance with their needs. In the case of the corn for adult feeding, however, it has been found much more satisfactory to send the cars straight through to their ultimate destination. Two-thirds of the corn cars are being so shipped now. The remaining third is being sent to Ribinsk and Tzaritzin, where the corn is stored in warehouses until the opening of the river navigation makes its shipment by water possible.

How great the volume of movement is for the A.R.A. supplies may be gathered from the activities of five days in Moscow, during which four solid train loads of child-feeding supplies left for Kazan, Orenburg and Samara, one train having as many as 38 cars. This was exclusive of the movement of corn from the ports. The volume of this movement is shown by official figures for the month of March, during which time 170,000 tons were evacuated from Baltic and Black Sea ports. The total of foodstuffs arriving at the ports from America between February 7 and March 31 amounted to 291,000 tons.

To deal with this enormous tonnage, the Soviet government, under an agreement effected with Esthonia, is using 1,000 Esthonian cars at Reval. These can be employed solely for the shipment of American supplies under the terms of the agreement, and must be returned in 15 days, failure to comply with which condition makes the Soviet liable to pay demurrage. Poland is also helping to ship supplies for the famine sufferers, having guaranteed under an agreement effected with the A.R.A. to transport 15,000 tons a month free to Stolpce on the Russian border from the port of Dantzig.

The London & North Western Railway to absorb the North London.

A CIRCULAR has been issued under date July 1 to the proprietors and debenture stockholders of the North London Railway in connection with the proposed absorption of that line by the London and North Western Railway. This follows a provisional agreement with the directors of the London and North Western Railway Company, under which the North London Railway Company will be amalgamated with the London and North Western Railway Com-

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GREAT EASTERN RAILWAY OFFICERS AT THE ROYAL AGRICULTURAL SHOW.

Left to right.—Mr. H. J. Prytherch, M.B.E. (Chief Assistant to Superintendent of Operation); Mr. R. A. Newman (Chief Outdoor Assistant to Commercial Superintendent); Mr. T. W. Watts (Commercial Superintendent); Col. H. H. Mauldin (Superintendent of Operation); and Mr. C. M. Stedman (Locomotive Running Superintendent).

[*An article dealing with the work of the Great Eastern Railway in connection with the Royal Agricultural Show at Cambridge, July 4–8, will appear next month.*]

pany, the arrangement to have effect as from January 1 last.

The terms on which the several stocks of the company will be exchanged for stock of the London and North Western Railway Company are set forth. A meeting of the proprietors and debenture stockholders will be summoned at a later date, when the proposed scheme will be submitted for their approval.

Grouped Railway Titles.

As indicated last month, the titles to be adopted officially by the four groups which are being formed under the Railways Act of 1921, have not yet, we understand, been finally decided upon. The subject is, however, exercising the minds of many people, including railway officers and many engaged in railway service, as well as a large proportion of our readers who are not railwaymen in any official sense. A number of interesting suggestions have been made, and the following, which have been set forth in the pages of our contemporary, the *Railway Gazette*, may be collected :—

(1) *Southern Group.*—London and Southern; London and South; South Eastern; Southern; South Anglian; and Southern Transportation Service.

(2) *Western Group.*—Great Western; Western; South Western Transportation Service.

(3) *North Western, Midland and West Scottish Group.*—Midland and North Western; London and West Britain; North Western; Northern; British North Western; Midland; Central; West Coast Joint; Western Transportation Service; and North Midland.

(4) *North Eastern, Eastern and East Scottish Group.*—Eastern Joint; London and East Britain; North Eastern, Eastern; British Eastern; York and Joint Eastern; Eastern Joint; and Eastern Transportation Service.

It will therefore be seen that some curious ideas are current as to titles suitable for use, also that, in the case of the two latter groups, the difficulty of obtaining distinctive titles without taking a name from another group has by no means been surmounted. We are inclined to agree, in fact, with an editorial suggestion from the pages of our contemporary, suggesting "Great Southern" for the Southern Group, "Midland and North Western" for the North Western, Midland and West Scottish Group, and either "North Eastern" or "Great Northern" for the North Eastern, Eastern and East Scottish Group, retaining, of course, the title of "Great Western" for the Western Group.

British "Pacific" Locomotives Compared.

THE article under this heading given last month was intended to answer frequent queries received for "The Why and the Wherefore" section and to anticipate others. Partly attributable to the printer, and partly due to inserting certain particulars not clearly given, two or three errors crept into the table on page 25, which now require correction. In the case of *The Great Bear*, the empty weights on coupled wheels were given, whereas the working order weights are required—20 tons in each case. Total weight (engine) in working order is 97 tons 6 cwt., and of the tender 45 tons 15 cwt., making a total of 143 tons 1 cwt. In the particulars of the Great Northern engine

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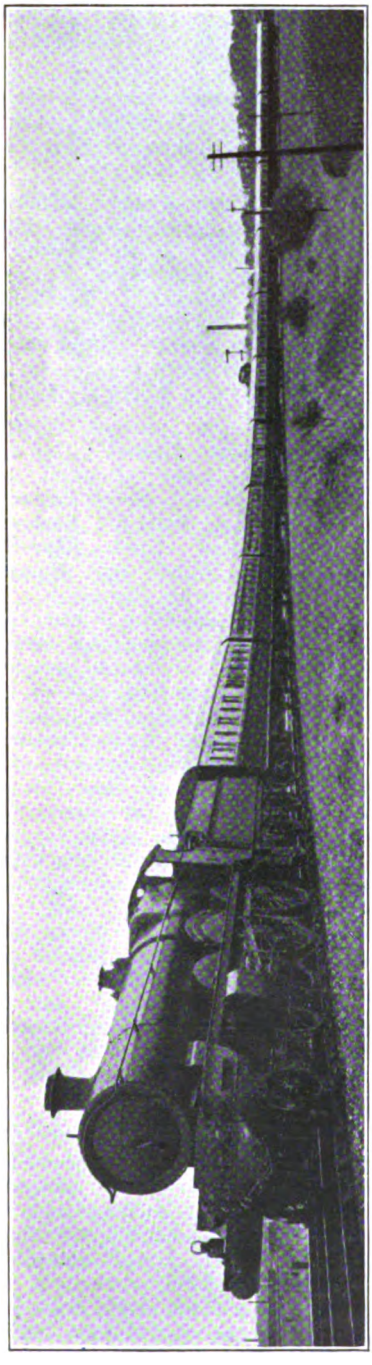

VEHICLES FOR 10.30 a.m. "CORNISH RIVIERA" EXPRESS, GREAT WESTERN RAILWAY, PAINTED IN NEW COLOURS, CHOCOLATE BROWN LOWER PANELS, AND CREAM UPPER PANELS.

the weight on coupled wheels should be 20 tons in each case.

Important Reductions in Freight Rates.

An official statement has been issued detailing the important reductions in freight rates arranged to come into operation on and from August 1, 1922. It is well known that for a long time the English and Welsh railway managers have been conferring with representatives of trade and agriculture (organised by the Federation of British Industries) in the endeavour to arrive at a decision on this matter that would be satisfactory to the trading community and reasonable to the railway companies, and the extent and scope of the reductions now announced show how carefully the question has been investigated.

The amount involved in the reductions represents an annual figure of considerable magnitude, and unless traffic develops on an adequate basis, the railway companies are likely to lose a lot of money over the transaction. Confidence is, however, expressed that these further rates concessions will give a fillip to industry and trade sufficient to justify the steps taken to assist in their resuscitation. It is, moreover, of importance to note that, under the settlement, neither the Federation nor the railway companies will apply or be parties to any application for a general alteration to come into operation prior to July 1, 1923 of the rates and charges agreed.

The reductions now made mean that both class and exceptional rates on merchandise traffic carried by goods train will be 75 per cent. above the rates in operation on January 14, 1920, in place of 100 per cent. above such rates. In those cases where a rate has already been reduced to a figure less than 75 per cent. above the corresponding rate on January 14, 1920, the existing rate will remain unaffected. "Smalls" are reduced from 150 per cent. to 100 per cent. above the rates on January 14, 1920, while in the case of flat rate increases, reductions are from 1s. to 6d., 9d. to 4d., 6d. to 4d., the 3d. rate being unaffected. It is laid down that the settlement does not affect the question of merchandise carried by passenger train, nor any negotiations relating thereto.

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MR. A. G. SMITH, who recently retired from the position of Canals Manager, Great Western Railway, after over 50 years' service with the Company, was originally in the Traffic Department. In 1881, he was transferred to the Divisional Engineer's Office at Newport, being subsequently appointed, in 1886, to the position of Chief Clerk in the office of the late Mr. Alfred Gooch, who was then in charge of the pumping and ventilating plant. In 1891, Mr. Smith joined the office of the Chief Engineer at Paddington, and in 1897 was made Chief Clerk by Mr. (afterwards Sir James) Inglis, and, in 1902, Office Assistant, in which capacity he continued under the present Chief Engineer, Mr. W. W. Grierson, until he became Canals Manager at Bath in 1916. The period of his service in the Chief Engineer's Office was one of rapid development, calling for initiative and detailed knowledge, the department being reorganised from its former divisional administration into one centrally co-ordinated. He was a valued and useful member of the Executive Committee of the Railway Temperance Union, the Dining Club and the Great Western Railway Literary Society, of which he was Chairman at the time of his transfer to Bath. Mr. Smith recalls with satisfaction and pride that the present Great Western Railway General Manager was a member of his staff for about eight years.

MR. A. G. SMITH,

Who has retired from the position of Canals Manager, Great Western Railway.

* * *

MR. J. H. VICKERY has been entertained by the leading public bodies of Newport (Mon.) to a complimentary banquet, on which occasion an address of congratulation was presented to him in recognition of his untiring efforts to advance the trade of the port, and to mark his appointment to the position of Chief Docks Manager in the Great Western Railway service. In thanking his hosts for the compliments paid to him, Mr. Vickery assured them he valued most this practical mark of their feelings towards him and their good wishes for his future success in his new undertaking. It heartened and encouraged him in the discharge of the arduous and exacting duties which he would have to perform in the future. In the various walks of life, in the manifold ups and downs that all must experience, there could be no greater encouragement than the approbation and appreciation of one's fellow-citizens, and he was very proud to have been thus honoured after what to many of them seemed to be a somewhat short time amongst them.

* * *

MR. J. GOWAN CLARKE, Secretary and Accountant of the Rhymney Railway, has recently retired after serving for 43 years. Starting in 1879 in the Audit Office, Mr. Clarke subsequently transferred to the Secretary and Accountant's Department, and was, in 1918, appointed to the position from which he now has retired.

* * *

MR. PAUL GIBB, who has been appointed Assistant Accountant, North Eastern Railway, is a son of Sir George Gibb, formerly General Manager of the North Eastern

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MR. PAUL GIBB,
Assistant Accountant,
North Eastern Railway.

Railway, and subsequently Chairman of the Roads Board. Mr. Paul Gibb was educated at Rugby and Cambridge After leaving Cambridge, he qualified as a solicitor, but eventually joined the Traffic Department of the North Eastern Railway. He subsequently held various positions in the Divisional Goods Manager's office at Newcastle. He was Assistant District Goods Manager from November, 1919, to April, 1921, and afterwards Assistant to the Chief Goods Manager, dealing with questions arising out of the revision of goods rates. During the war, Mr. Gibb attained the rank of Major in the Royal Army Service Corps, and was awarded the Military Cross

* * *

AT the annual meeting of the Railway Servants' Orphanage, recently held at Derby, Mr. H. E. Ayre presided and was supported by Messrs. A. L. Charles (Vice-Chairman), C. F. Graseman, A. E. Mills (General Secretary, Railway Benevolent Institution), F. A. L. Barnwell, A. L. Newton, Colin Roberts, &c. The Chairman said that during the year 42 children were admitted, and the Institution was full, with 272 on the books. The financial position was satisfactory, though the income was less than last year. Nearly 100 old pupils were subscribers to the funds. A movement among the Midland locomotive men at Derby of paying regularly a penny each week was commended, and the men on the Cheshire Lines, the Great Eastern and the North Eastern systems had also responded in good numbers to appeals made to them. Great encouragement was given by the continued success of the Derby Concert Committee, who had raised £1,750, and the North Staffordshire Local Committee, who had contributed £874. The South Eastern and Chatham Committee raised nearly £275 in their district and the model "Rocket" collecting boxes at the various stations had secured 157,193 pennies —£654 19s. 5d. Lord Claud Hamilton was re-elected treasurer, and in view of the successful effort of the committee under Mr. H. F. Loney's chairmanship, a Derby Concert Committee "Henry Frith Loney" Permanent Presentation has been instituted by the investment of £525. Mr. Albert E. Dean, the Secretary of the Orphanage, was complimented as one who attended to all the interests of the Institution in a very satisfactory way. The prizes were afterwards presented to the children by the Duke of Devonshire.

* * *

MR. H. LANGRIDGE, Stationmaster at East Croydon, has been appointed to London Bridge (London, Brighton and South Coast Railway) in succession to the late Mr. Edwards.

* * *

THE death, on July 6, of Mr. George Jeal, who for the last twelve years was Station Superintendent at Victoria (L.B. & S.C.R.), has removed one of the best known and popular officials in the railway world. Mr. Jeal who was 62 years of age, joined the service of the Brighton Railway in 1874, and after serving in various capacities received his first appointment as stationmaster in 1887. He was at various times in charge of the following stations: West Norwood, Earlswood, Norwood Junction, New Cross and London Bridge, until his final appointment at Victoria in 1910.

* * *

A MEMORANDUM issued by the Association of Superannuated Railway Staff (of which the Hon. Secretary is Mr. M. G. Sydney, St. Mary's, Cheney Street, Eastcote, Middlesex, and the Chairman, Mr. G. Bethel Bayley, 170, Birchanger Road, South Norwood, S.E. 25), directs attention to some of the anomalies and difficulties which this association is endeavouring to remedy. In the main it is concerned with the fact that railwaymen who have been superannuated upon the old basis of payment are adversely affected by the increased cost of living. The matter is, however, accentuated by conditions arising out of the amalgamation of railway companies as required by grouping, with a result that men who have now to work side by side under the same company are subject to

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different and, in some cases, less favourable conditions than men of the company to which they have been transferred. The association appeals for funds to enable them to assist the more needy cases of men superannuated under pre-war conditions, and their efforts are further directed to dealing with the various problems which arise to ensure equitable treatment of all railway servants as they become eligible for superannuation.

* * *

Recently, at the Bridge House Hotel, London Bridge, about 200 locomotive men sat down to the first dinner arranged under the auspices of the South Eastern and Chatham Railway Drivers, Firemen, and Cleaners' Pension Fund Society. The Outdoor Locomotive Staff Superintendent presided and representatives were present from locomotive depôts all over the South Eastern and Chatham system. The secretary, Mr. H. Richardson, in responding to a toast, gave an outline of the position of the Society, stating a number of members had been written off owing to the reduction of staff, but the society was to be congratulated on its position in owning approximately £45,000 after only five years existence. Mr. Jones was thanked for his attendance and responded in a speech that was much appreciated. A musical programme provided by the Battersea Locomotive Minstrels was greatly enjoyed.

* * *

On Saturday, July 8, the third annual championship meeting of the Great Eastern Railway Amateur Athletic Association was held on Thornton Field, Warton Road, Stratford, with following results :—

Championships.

100 *Yards Championship*—

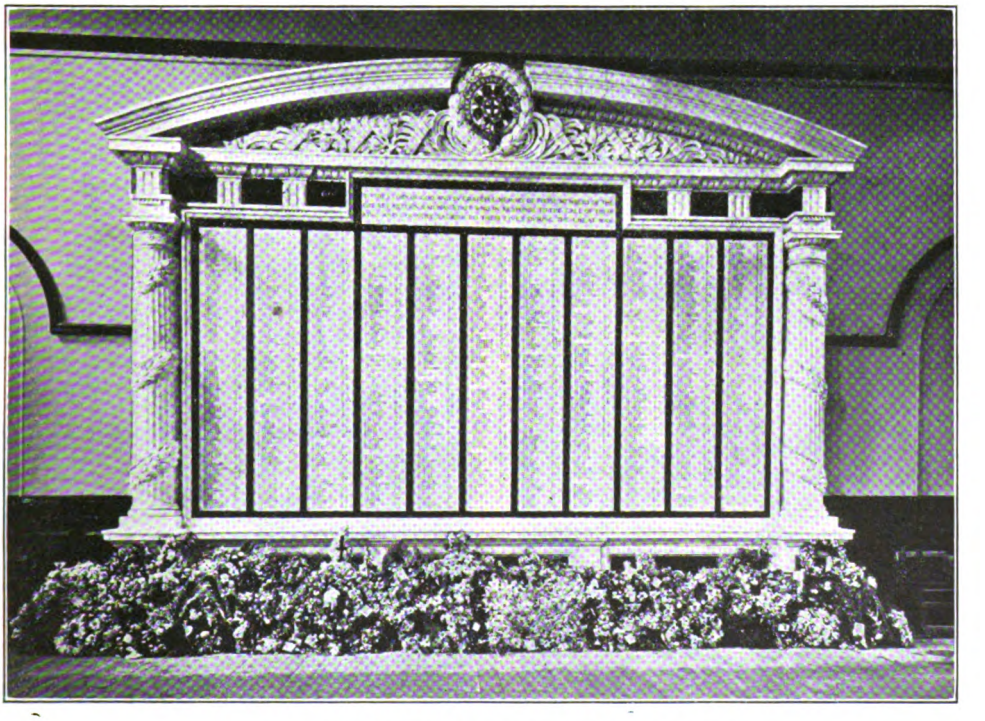
F. W. Spackman (Bishopsgate) ..	1
W. Driver (holder) Cambridge ..	2
A. F. Seach (Stratford)	3

Time : 11 secs.

220 *Yards*—

F. W. Spackman (Bishopsgate) ..	1
R. Brown (Whitemoor)	2
E. T. Yareham (Stratford)	3

Time : 24⅗ secs.



THE GREAT EASTERN RAILWAY WAR MEMORIAL.

Unveiled at Liverpool Street Station on June 22, by the late Field-Marshal Sir Henry Wilson, M.P., a few hours before this great and gallant soldier was assassinated.

The Memorial bears 1,220 names and is 25 ft. wide and 20 ft. long.

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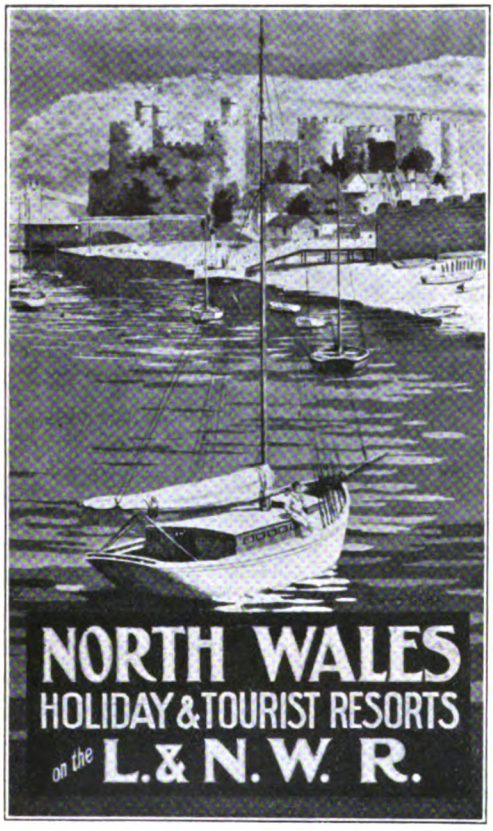

LONDON & NORTH WESTERN RAILWAY "CONWAY" POSTER.

Half-Mile—

S. R. Filer (Stratford)	1
C. G. Chumbley (Temple Mills) ..	2
L. Garrett (Stratford)	3

Time : 2 min. 7 secs.

Mile Flat—

C. G. Chumbley (Temple Mills) ..	1
H. W. Payne (Stratford)	2
P. A. Taylor (Bishops Stortford) ..	3

Time 4 min. 51⅘ secs.

Two Miles Walk—

E. T. W. E. Sussum (holder) (Cambridge)	1
W. E. Baldwin (Stratford) ..	2
H. F. Harwood (Stratford) ..	3

Time : 15 min. 55 secs.

Mile Departmental Relay—

Operating Department (P. A. Taylor, A. F. Serch, W. Driver, R. Brown)	1
Chief Mechanical Engineers (H. W. Payne, C. G. Chumbley, S. E. Filer, E. Yareham)	2

Tug-of-War—

March Locomotive beat Ipswich C.M.E. Department (holders) by two pulls to one.

High Jump—

J. Day (Bishops Stortford) 5 ft. 1 in	1
A. E. Roberts (Liverpool Street) and A. R. Scott (Liverpool Street) tied for 2nd place at 5 ft.	

Long Jump—

J. Herbert (Stratford) 18 ft. 1 in. ..	1
A. B. Lockhart (Stratford) 17 ft. 10 in.	2
J. H. Cobb (Liverpool Street) 16 ft. 7 in.	3

Putting the Shot—

J. Miller (Liverpool Street) 31 ft. 1 in.	1
F. W. Joyce (Cambridge) 30 ft. 4 in.	2
E. H. Ashe (Stratford) 29 ft. 3 in.	3

* * *

DURING the first week in July, the Permanent Way Institution (Incorporated) held a summer convention at Bristol, under the presidency of Mr. Alfred W. Szlumper, C.B.E., M.Inst.C.E. (Engineer-in-Chief, London and South Western Railway). The members of the Institution number about 1,800, and they are drawn mainly from the engineering departments of British and Colonial railways. In connection with the Conference, a number of trips were made, and the places visited included Bath, the Westinghouse Brake and Saxby Signal Company's works at Chippenham, Exeter, Weston-super-Mare and Ilfracombe.

* * *

FROM the London office of the Italian State Railways is issued a practical publication setting forth how even the mere novice in Continental travel can pass an economical holiday in Italy under extremely attractive conditions. It shows, for example, how a month's tour can be accomplished for under £35, including cost of travel, accommodation at good hotels and all incidental expenses, also how for a much lower sum a holiday of shorter duration can be spent.

* * *

For those who desire inexpensive holidays on the coast of France, the South Eastern and Chatham Railway has published an illustrated guide, entitled "The Golden Sands of Picardy." Lovers of Charles Dickens's works can secure a delectable booklet "The Country of Charles Dickens," by C. Sheridan Jones; illustrated by Ernest Coffin. New editions are in circulation of "A Golfer's Guide to the Garden of England," and "Through the Garden of England," and both are useful books for the prospective

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holiday-maker. Several new folders have been issued, giving train times of the Continental services, while for the French visitor to England there is on sale a pleasing guide-book, published at two francs, entitled "Les Blanche Falaises d'Albion." This book, in the French language, is by A. Pascal Stormont and should do much to extend the influence of the *Entente Cordiale*. Of posters, the South Eastern and Chatham Railway this year exhibits a fine selection. Appeal is made to varying tastes, such as lovers of scenery and ancient buildings, those with literary leanings, and people who are attracted by pictures of railway trains and trans-channel steamboats. Perhaps the poster that is receiving the most attention just now, is one illustrating a cheque on the "Bank of Sunshine (un) Limited." The sum is for £10, and the poster intimates that this amount now buys a return ticket from London to the sunny French Riviera and secures a reserved seat in the through carriage from Calais.

A WELCOME addition to the list of holiday literature is a book entitled "Picturesque Normandy," which has just made its appearance. The publication contains 80 pages, with numerous coloured and other illustrations, and it describes, in an entertaining manner, the coast resorts and inland towns and villages of this delectable French province, and gives valuable hints to intending travellers. It is published by the London, Brighton and South Coast Railway, and copies can be obtained, post free 1s. 3d., from the Publicity Department, London, Brighton and South Coast Railway, London Bridge Terminus, S.E. 1, and also price 1s. each at various booksellers and bookstalls.

* * *

ONE of the most remarkable societies in Great Britain is "The Co-operative Holidays Association." It was founded in 1893, and its headquarters are at College House, Brunswick Street, Manchester. It arranges holidays all the year round, and it has guest-houses, both at home and abroad. It is

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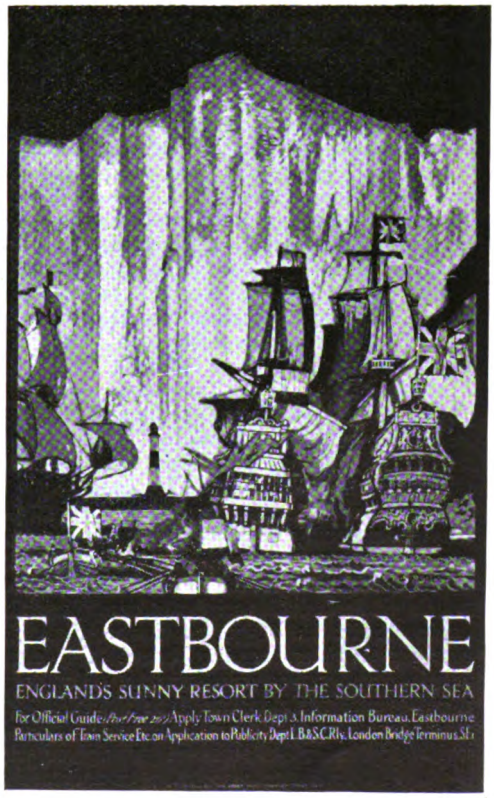
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LONDON, BRIGHTON & SOUTH COAST RAILWAY.

Above are half-tone reproductions of two very fine posters. The originals, printed in colours, are singularly attractive.

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not a profit-making body, any surplus income being devoted to furthering the work of the Association. Neither is it connected in any way with the Co-operative trading societies, the term "co-operative" being used in its title to express the spirit of fellowship, goodwill and mutual service which characterises all its activities. We have perused with great interest the current programme of the Association, and have pleasure in recommending its consideration. The British centres include the Western Highlands of Scotland, the Lake District, Yorkshire, the Peak District of Derbyshire, North Wales, Isle of Man, Isle of Wight, and Sussex. Under its auspices very pleasant Continental visits may be made to such attractive centres as Brittany and Switzerland. RAILWAY MAGAZINE readers should write to the Assistant General Secretary, at the address before given, and obtain full particulars for themselves.

* * *

OUR Crewe correspondent, Mr. C. Williams, writes:—The first five of a new series of 0-8-0 superheater goods engines ("G2" class) are now in hand. Nos. are 344, 872, 2182, 895 and 994 (Crewe Nos. 5702-6). Work is also well in hand on the remaining five engines, but none of these had been numbered up to the time of writing. Two further four-cylinder compound passenger engines have been converted to two-cylinder simple, "Renown" class, viz., Nos. 1911 *Centurion* and 1942, *King Edward VII*. The following 4-cylinder compound mineral engines have been simplified and superheated, as 0-8-0, "G1" class:—Nos. 640, 1278, 1432 and 1899 (0-8-0, "B" class) and No. 2114 (2-8-0, "F" class). Recent additions to the stud of named engines are the following:—"Claughton" class: No. 13 *Vindictive*, No. 1747 *Frobisher*, No. 1096 *Talisman*, No. 1599 *John o' Groat*, No. 2499 *Ingestre* and No. 2268 *Patience*; "Prince of Wales" class: No. 22 *Stentor*, No. 2516 *Dalton* and No. 504 *Canning*, while No. 1290 is *Lucknow* and No. 1694 is *Premier* (not as printed last month).—Engines recently broken-up include the 6-ft. 2-4-0 passenger engine No. 36 *Thalaba*, the disappearance of which severs the last connecting link with the original Grand Junction engine built in 1837, no fewer than *five* distinct engines having borne the same number and name successively. No. 3718, a 0-6-2 coal tank engine (late No. 142), has also been scrapped. Two additional Horwich-built 4-cylinder 4-6-0 passenger engines with 8-wheeled tenders have been transferred to Crewe (No. 15) shed, viz., Nos. 1657 and 1658.

* * *

A BATH correspondent, who has just returned from a visit to the Isle of Wight, was interested to note that the coincidence of a run from Fratton to Portsmouth Harbour station, en route for Ryde, on a train of London, Brighton and South Coast stock, hauled by No. 184, the 0-4-2 locomotive of the "Gladstone" class, which still bears the name *Stroudley*, bestowed as a posthumous tribute to the designer, was followed by encountering on the metals of the Isle of Wight Central Railway four of the famous "Terrier" 0-6-0 side tanks of the Brighton line. All were in regular service and used impartially for passenger traffic or shunting duties. These plucky survivals are numbered from 9 to 12 inclusive.

* * *

ALTHOUGH it is over 20 years since the late Mr. Drummond introduced his chimney with beaded rim on the South Western Railway, many locomotives of Mr. Adams's design still retain the older "stove-pipe" chimney after rebuilding. This statement applies to locomotives of various classes designed by Mr. Adams, most of which are still in service. Many of his older type of 4-4-2 side tanks are, however, now finding their way to the scrap heap.

* * *

ONE of the 2-8-0 R.O.D. locomotives of Great Central design, No. 3017, which were acquired by the Great Western Railway, has recently been rebuilt at Swindon, and has been painted in the standard Great Western colours. The "pop" safety valves have been replaced by safety valves enclosed in the standard Great Western pattern of safety valve casing and the initials "G.W.R." appear above number on the number plate.

* * *

MR. HENRY GREENLY, A.I. Loco. E., has resumed his private practice as a consulting engineer and designer in model locomotive, railway and small power engineering. His office is at Ashley Road, Farnborough, Hants. In addition, he is supplying full-size blue prints for model locomotives and railway builders; he has written two new books on model steam and electric locomotive construction. A new 3-in. centre screw-cutting lathe (the "J.R.") is also one of his successes.

* * *

ON June 29, the Great Western Railway conveyed a party of guests from Paddington to Swansea for the opening ceremony of the Anglo-Persian Oil Company's refinery at Llandarcy near Skewen, and within a short distance from Swansea docks, recently taken over by the Great Western Railway. Besides the President of the Board of Trade, the party included Viscount Churchill and other directors of the Great Western Railway. Sir

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Charles Greenway, Bart., Chairman of the Anglo-Persian Oil Company, Lord Cowdray, Lord Dynevor, Mr. Felix J. C. Pole, Mr. Collett, Mr. Nicholls and some 180 others. From a RAILWAY MAGAZINE reader who participated in the trip we have received the following report :—

The train, which left Paddington at 8.40 a.m., consisted of 12 corridor coaches, including 5 restaurant cars and the directors' saloon. It weighed 410 tons, and was drawn by the 4-cylinder 4-6-0 express locomotive No. 4032, *Queen Alexandra*. A very rapid start was made; Slough was passed in 20 min. and Reading reached in 38 min. after leaving Paddington. After a brief stop to pick up Mr. Pole, the Great Western Railway General Manager, at Reading, the engine soon got into its stride again and some high speeds were attained, 80 miles an hour being reached, while the Severn tunnel was negotiated in 4¾ min., a very rapid passage with such a load, which was one of the heaviest passenger trains that has ever passed through the tunnel. Swansea was reached about 12.25, some 5 min. early. The return journey, announced to start at 5 p.m. and reach London at 9 p.m., an extra 10 min. being allowed for the up journey on account of the delays which might be met with on approaching Paddington, was equally meritorious. After very careful running through the maze of junctions between Swansea and Newport the train got away in splendid style and covered the 77 miles between passing Swindon and arrival at Paddington in 80 min. including a stop at Reading to drop one or two of the party. The time of arrival was 8.40 p.m. instead of the 9 p.m. booked.

* * *

As an item of interest in connection with the railway grouping that is taking place, Mr. Chas. Hutton writes :—

Wool sales are being held periodically at Hull, and the Eastern Group is endeavouring to make this port popular with the West Riding. On the day of the sale, a special train is run from Bradford in the morning to Hull, returning from Hull in the evening after the sale. Breakfast and dining cars are attached. The train works from Bradford Exchange Station *via* the Great Northern Railway to Holbeck, High Level Junction, then backs down the spur to the North Eastern Railway, and goes forward through Holbeck Midland and Engine Bridge Junction to Leeds New Station (as do most Harrogate trains) and thence, after calling there, to Hull; it returns the same way. A North Eastern engine works the train throughout; a North Eastern shunting engine is attached in the rear to come down and go up the spur at Holbeck. North Eastern Railway corridor rolling-stock is used. On the occasion when I used the train, the engine was a Class "R" and the kitchen-car was a Great Central vehicle, the rest of the train being North Eastern Railway stock. The pre-group method of working would have been over the Midland Railway from Bradford to Leeds. Even with the above method of working, it is impossible to absolutely avoid the Midland-North-West Group, as the ex-Lancashire and Yorkshire are the owners of the line about ¼-mile from Bradford Exchange Station to Mill Lane Junction, and the Midland Railway of the same distance of line through Holbeck Low Level Station to Engine Bridge Junction, Leeds.

* * *

AUGUST 8TH will be the last day on which passengers will be able to travel on the City and South London Railway between Euston and Moorgate stations. August 9 will see the beginning of the re-construction of this portion of the line and the following stations will be closed down :—Euston, King's Cross, Angel, City Road, Old Street. Borough station has been closed since July 17, to facilitate the work of widening the line. When the work is completed the carrying capacity of this line will be increased by 100 per cent. In order to cope with the heavy traffic which is anticipated, provision has been made for equipping more than half the stations with escalators instead of lifts.

* * *

AMONG the re-construction schemes of the London Underground are the equipment of escalators at Bank, Oxford Circus Central London Railway, Tottenham Court Road and Shepherd's Bush stations.

* * *

JUST lately the Railway Club has had a very full programme of events, June's doings comprising two meetings and two visits; the two latter were paid to Strawberry Hill and Willesden Steam Sheds by the courtesy of the London and South Western and London and North Western Railways, whose representatives did all in their power to give members an interesting and instructive time. On June 9, at the regular monthly meeting at 65, Belgrave Road, S.W.1, a well-informed paper was presented by Mr. C. A. Hunt on "The South Eastern and Chatham Railway as the First Railway Group," this proved an excellent subject for treatment, especially at the present time, and the lecturer's legal knowledge enabled him to point out several matters in the composition of the "Managing Committee" which generally receive scant attention in the daily press; the historical analysis and account of the resultant train working were particularly well done. On

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June 23, Mr. T. M. Lewis gave a paper at an informal meeting entitled "An Original Time Table for the Great Western Railway." Mr. Lewis knows his subject well and discussion of his proposals proved of great interest; it is hoped to continue this series of meetings which have all the charm of smoking room talks, without the formality of the regular gatherings of the Club. At both meetings the lecturers must have been gratified by the amount of informed criticism that was evoked. There will be no meetings in the summer months, activities being resumed on September 12 when Mr. W. J. Sadler will read a paper on a signalling subject.

* * *

ON this page is illustrated the recent cutting of the first sod of a new railway, 21 miles long, between Halwill and Torrington, linking up North and South Devon. The new line will be worked by the London and South Western Company, but it is owned by the North Devon and Cornwall Junction Railway.

A WEST of England correspondent writes:—At present the main line trains of the London and South Western Railway necessarily have a distinctly parti-coloured appearance, due to the frequent inclusion of coaches of the new emerald green shade, as well as rolling-stock painted in the familiar tints of buff and slate colour. It is, of course, only a question of time before the symmetrical appearance of the rolling-stock is restored, and in the meantime Mr. R. W. Urie may be congratulated on the graceful outlines of his "490" and "736" classes, compared with the 4-6-0 designs of the late Mr. D. Drummond. Mr. Urie's engines recall the practice of the Northern Railway of France.

CUTTING THE FIRST SOD OF THE HALWILL-TORRINGTON LINE, NORTH DEVON AND CORNWALL JUNCTION RAILWAY.

(1) Mr. Arthur Neal, M.P., Parliamentary Secretary to Ministry of Transport, at work with the spade; (2) Lieut.-Colonel H. F. Stephens, Manager and Engineer, Shropshire & Montgomeryshire Light Railways and the Kent & East Sussex Railways, &c.; (3) Mr. J. Wilson, formerly Engineer, Great Eastern Railway.

* * *

ON Saturday, July 15, the Fourth Annual Sports Meeting of the Metropolitan Railway Athletic Association was held at Wembley Park. The gathering was most successful and an illustrated report will appear in the September RAILWAY MAGAZINE.

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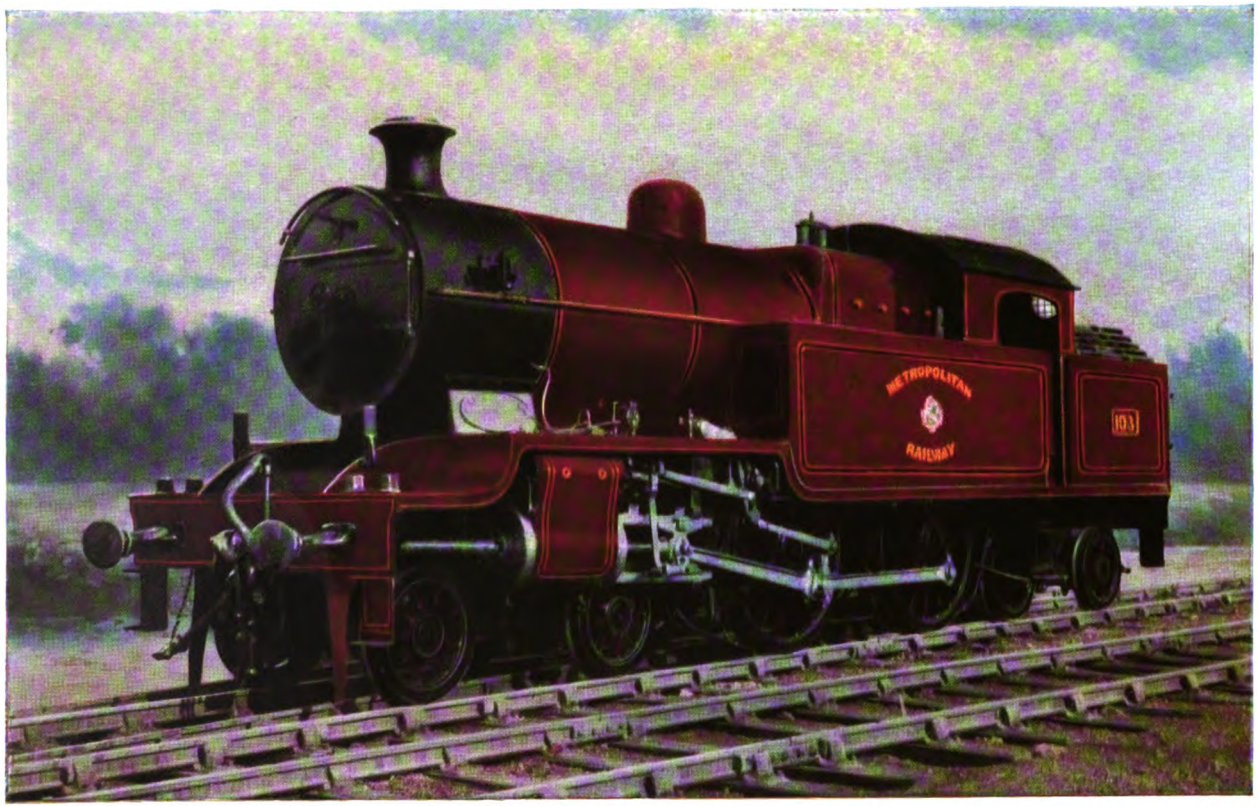

THE RAILWAY MAGAZINE.

METROPOLITAN RAILWAY 4-4-4 TANK ENGINE No. 103.

Designed by Mr. CHARLES JONES, M.Inst.C.E., M.I.E.E., Chief Electrical and Mechanical Engineer.

Fitted with Belpaire Boiler, Wakefield Mechanical Lubricator, Robinson Superheater, etc.
Cylinders, 19 in. by 26 in. Coupled Wheels, 5 ft. 9 in. diam. Bogie Wheels, 3 ft. diam.
Heating Surface: Ordinary Tubes, 765 sq. ft.; Flue Tubes, 281 sq. ft.; Superheater, 268 sq. ft.; Firebox, 132 sq. ft.; Total 1,446 sq. ft.
Steam Pressure, 160 lbs. per sq. in. Tractive Effort at 80 per cent. Boiler Pressure = 17,411 lbs. Tractive Effort per ton of Adhesive Weight = 446 lbs.
Grate Area, 21·4 sq. ft. Tank Capacity, 2,000 gals. Bunker Capacity, 4½ tons. Brakes, Steam and Hand, with Vacuum for Train.
Weight in Working Order, 77 tons.

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Photo.] **PULLMAN CAR TRAIN NEAR AMERSHAM.** [*Chas. S. Lake.*

New 4-4-4 superheater tank locomotive.

The Metropolitan Railway:

ITS CHARACTERISTICS AND ITS METHODS.

By W. PARKER.

A PIONEER, not in the backwoods of America, but in the heart of London, was the Metropolitan Railway, when its first short length of 3½ miles, embodying seven stations, was opened on January 10, 1863, for did it not stand unrivalled as the greatest railway wonder of the world? The first railway deliberately designed for inter-urban transportation purposes, in pre-tube days it shared with the Metropolitan District line, the first section of which was opened on Christmas Eve, 1868, the bewilderment of the "world and his wife" when those unsophisticated worthies came to town at "cattle show time," or on great national occasions, such as royal jubilees, marriages and funerals. A pioneer the Metropolitan Railway remains to-day; for it leads the way in more than one field of railway activity, and under the guidance of a progressive Board of Directors and a capable band of executive officers it is ever to the fore in the propagation, and the adoption, of the most modern methods of railway administration and management.

The original section from Farringdon Street to Praed Street (Paddington), afterwards extended eastwards to Moorgate, then on to Aldgate, and thence jointly with the District Railway to the Mansion House, and westward from Praed Street towards Kensington, to form the Inner Circle line, in conjunction with the District, still may be regarded as the trunk of the system.

Associated with the original enterprise are a number of other lines of prominent present-day importance. Such is the Hammersmith and City Railway from Westbourne Park to Uxbridge Road Junction and Hammersmith, which is jointly the property of the Metropolitan and the Great Western Railways. The Metropolitan is also one of the joint

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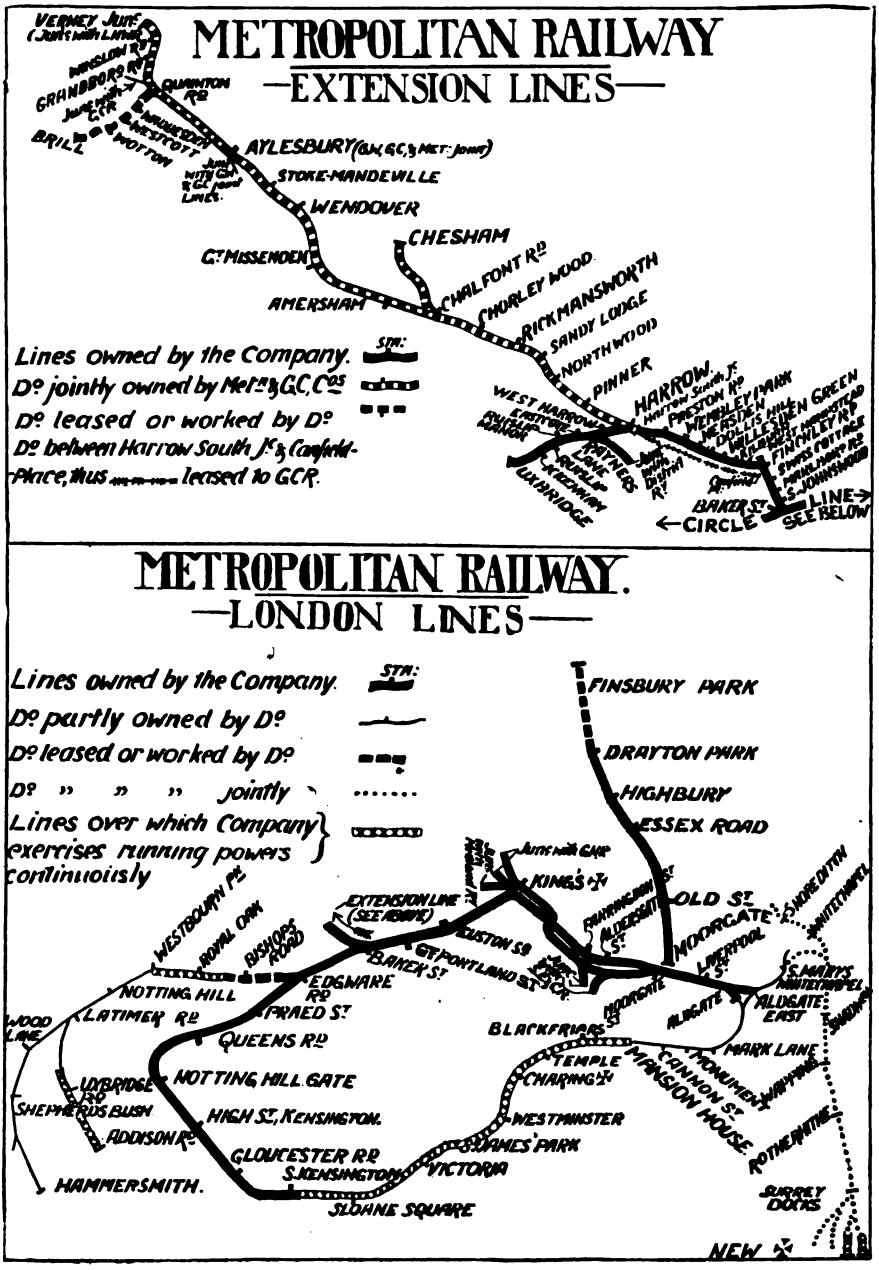

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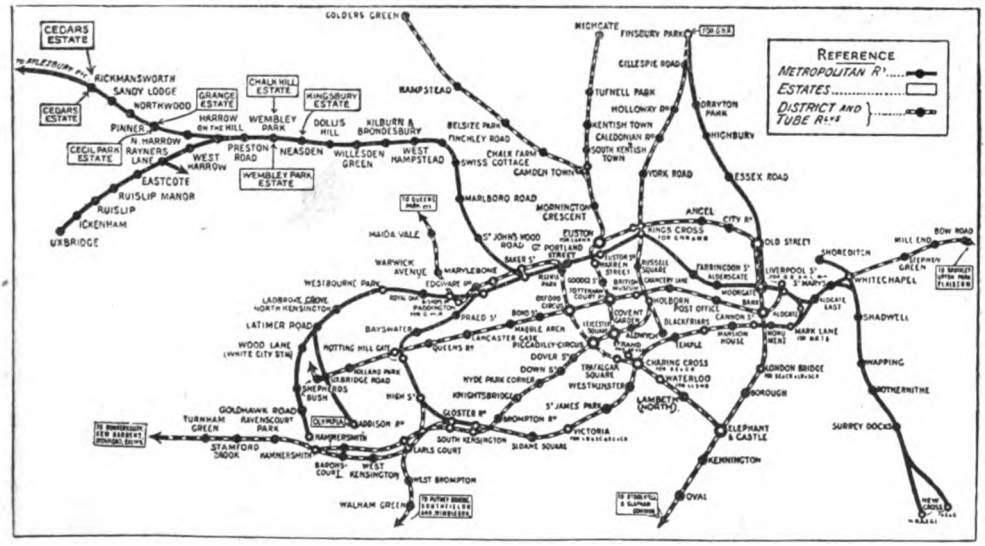
lessees of the East London Railway and, in addition to undertaking the management of this line, supplies and works the whole of the electric train service to the New Cross stations of the Brighton and South Eastern Railways, and likewise works the local services to Shoreditch. Then there is the City Lines extension through Aldgate East and St. Mary's, Whitechapel, while from July 1, 1913, the Great Northern and City "tube" has been amalgamated with the Metropolitan. Last, but not least, there is the Harrow extension line, that has developed into a 50-mile main line through Middlesex into part of Hertfordshire, and then onward



METROPOLITAN RAILWAY AND ITS CONNECTIONS.

The map shows the locations of the properties of the Metropolitan Railway Country Estates, Ltd.

far into the beechwoods and breezy uplands of Buckinghamshire, serving *en route* such important places as Rickmansworth, Wendover and Aylesbury, and making the Metropolitan system of to-day an undertaking of 78 miles.

In respect to the map on page 166, it should be noted that the Metropolitan Company's railway from Harrow South Junction to Verney Junction, excluding the Uxbridge branch, is leased to the Metropolitan and Great Central Joint Committee, and one section of the Southern lines from Harrow South Junction to the junction with the Great Central Railway near Finchley Road is leased to the Great Central Railway. The electrified lines, in addition to those forming part of the Inner Circle, Hammersmith, and Great Northern and City section, are those from Baker Street to Harrow and the branch thence to Uxbridge.

Since the Metropolitan Railway has been established in the passenger-carrying business it has dealt with humanity in a wholesale fashion, and while during the first year of its existence it conveyed 9,455,175 people, for the year 1921 the figures for passengers originating on the system were :—first class, 1,698,979 ; third class, 61,139,150 ; workmen, 12,334,294 ; total, 75,172,423. Then to these figures must be added the journeys of the season ticket holders and the passengers originating their travel on other lines. The number of season tickets issued during 1921 was 184,836. The estimated number of passenger journeys on this railway made during the year reached the colossal total of 182,000,000 !

Now, in addition to the normal growth and the certainty of further expansion, consequent upon the development of the various building estates served by the Harrow extension line—particularly those of the Metropolitan Railway Country Estates, Limited—comes the new chapter that is to be written in the spring of 1924, when

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Elliott] [*& Fry.*

MR. R. H. SELBIE, C.B.E.,

General Manager and Director,
Metropolitan Railway.

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the British Empire Exhibition, at present in the course of construction at Wembley Park, will be opened, with appropriate ceremony. His Majesty the King is the patron of the Exhibition, and H.R.H. the Prince of Wales is Chairman of the general committee. The exhibition is being planned on a truly magnificent scale and the consequent public interest will ensure an immense increase in the passenger traffic over the Metropolitan Railway in 1924. In addition to the Metropolitan, the Great Central Railway and the London and North Western Railway each has a station adjacent to the site, so that it will be well served by railway communication. The Metropolitan Railway will furnish a splendid service of trains at intervals of one-and-a-half minutes. The exhibition gates will be reached in nine minutes from Baker Street, the chief station on the line and the one at which the chief offices of the railway are located. As the Metropolitan Railway, by means of the Inner Circle, is the connecting link between all the great London termini, it takes but little imagination to decide its extreme utility as a means of reaching the coming exhibition.

MR. JOHN WARDLE,
Commercial Manager.

To-day, when the Metropolitan Railway is handling such an enormous passenger traffic, and it is pointed out it was this development that made the revolutionary change from steam to electricity indispensable, not merely for the underground service, but also for the service to Harrow and beyond to Uxbridge, it is worthy of remark that it was, in the late Victorian period, when the Central London Railway was nearing completion, and the Metropolitan, and Metropolitan District directors were fearing consequent loss of traffic, that the decision to seek safety in electrification was determined.

In 1897 the proprietors of the District Railway obtained Parliamentary powers to work their lines by electricity and in the next year the Metropolitan Railway followed suit. In 1898 the two railways decided to spend £20,000 on experimentally equipping and working electrically the line between Earl's Court and Kensington High Street, on the ordinary direct current system. Afterwards it was proposed that the Ganz system of three-phase alternating current traction should be adopted, but following arbitration, on December 11, 1901, the Board of Trade issued a mandate that the direct current system should be used on the Inner Circle. This was inaugurated on September 12, 1905, and the last steam train running on Inner Circle services was withdrawn ten days later.

Since the date of the Inner Circle decision, and as a consequence of the transition from steam to electricity, the Harrow extension line has been widened and additional tracks laid down between Finchley Road and Wembley Park. Extensive viaducts have been built, and junctions put in, to afford relief to the evergrowing local traffic, and to enable the running of an express service of trains from Harrow and beyond for Baker Street and the City.

It is pointed out by the Company that the changes brought about a wonderful acceleration of the train service, now practically continuous on the busiest sections of the line. The further necessity arose to supersede manually-operated signals by automatic ones, and likewise to install automatic safety appliances

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MR. W. H. BROWN, J.P.,
Secretary.

Mr. W. HOLT,
Traffic Manager.

MR. CHARLES JONES, M.Inst.C.E., M.I.E.E.,
Chief Electrical and Locomotive Engineer.

MR. I. BUCHANAN PRITCHARD,
Solicitor.

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throughout. To-day the sections thus protected aggregate some 20 miles of line, and upwards of 493 automatic and power-controlled signals are in use.

So far as middle-aged Londoners are concerned, perhaps the most noticeable change on the Metropolitan Railway since the advent of electrical working, has been the reconstruction of Baker Street Station. Many there are who as children, *en route* to Madame Tussaud's waxwork exhibition, visited the old cavernous station in Mid-Victorian days, and can well remember its sulphurous characteristics, its impenetrable, mysterious gloom and its general ghostliness. But tunnels have been widened, new road-bridges constructed, platforms changed and tracks altered beyond the recognition of those whose only knowledge is of the past. In the modern Baker Street, which has two platforms in the circle station and four in the main station, the Metropolitan Railway possesses a chief station worthy of the company, and one calculated to deprive the passenger of his most treasured British prerogative—the right to grumble. Although the chief, Baker Street is not the largest station on the line. This distinction belongs to Moorgate Street, where the platforms, including those used by the Midland and Great Northern Railways and to which the South Eastern and Chatham Railway possesses running powers, number eight. At Moorgate Street the approximate number of trains in and out is 1,237 daily.

To the mechanically-minded an inspection of the Metropolitan Railway's power house at Neasden is what a close view and handling of the Koh-i-Noor would be to an enthusiastic Hatton Garden diamond dealer of Oriental origin. Of its class it is "a gem of the first water," for it is the most extensive power works in Great Britain owned by a single railway company. A rectangular building about 500 ft. long by 100 ft. wide, with numerous condensers and cooling towers standing beyond these limits, it furnishes energy to upwards of 85 miles of electrically-equipped railway track, and has an aggregate output of 50,000 horse-power, the units of electricity generated totalling more than 1,250,000 per week.

Labour-saving devices abound. Coal trucks are completely overturned by a mechanical tipper and the contents poured into a huge hopper. By a chain and bucket conveyor the coal ascends to bunkers in the roof of the building and then descends through automatic weighing shoots to mechanical stokers which evenly feed the chain grates of the furnaces. In the course of two hours each furnace consumes a ton of coal and is capable in the same period of evaporating 10 tons of water. The resultant steam is dried and superheated; it enters the turbines at a temperature of 540° Fahr. For three weeks at a stretch these turbines run and they rotate at 1,000 r.p.m., driving the dynamos which generate electricity at 11,000 volts. The foregoing by no means exhausts the details but, lest the non-technical reader may be wearied, suffice it to say that the boilers are stoked by a mechanical process, temperature is recorded by instruments with an expert in charge, and to facilitate the handling of ashes a tipping tray conveyor is used.

Water is a very important factor at the power station. It is pumped by compressed air from three artesian wells, each from 400 to 500 ft. deep, at the rate of 50,000 gallons per hour. The latest generating unit now nearing completion consists of a 12,000 kw. turbo-alternator set with jet-condensing plants, the complete unit being constructed and installed by the Metropolitan-Vickers Electrical Company, Limited. For minute particulars space cannot be spared, but it may be mentioned, when the unit is developing normal full-load output, the condenser will require about 11,600 gallons of cooling water per minute. Such a statement would draw from an old-fashioned Scottish dominie just one word, and that "prodigious!"

Before leaving the subject, however, it should be mentioned that the water from the Neasden artesian wells contains elements which, when the water is heated in the economisers or boilers at the power house, produces a hard scale on the tubes and possesses other disabilities. To overcome these troubles a water-softening plant has been installed which removes all undesirable elements before the water reaches the power station. The plant consists of chemical mixing and proportioning gear mounted on the top of a settling tank 42 ft. high and 25 ft. in diameter; a brick building for the storage of the chemical

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MR. H. S. STEWART,
Assistant to the General Manager.

MR. W. M. BALLINGALL,
Accountant.

MR. F. DAWSON,
Estate Agent.

MR. E. SUTTON,
Stores Superintendent.

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reagents; a filter house for the reception of the sand filters, air compressors and pumps; and there are large sludge pits in which to dry the refuse preparatory to its removal in railway trucks.

In working the electrified lines, great and important as was the provision and distribution of current, the full benefit of the system could not be obtained until electricity likewise had taken the place of manual working in the signal cabins, so that trains could be run closer together than the manually-worked signals would permit.

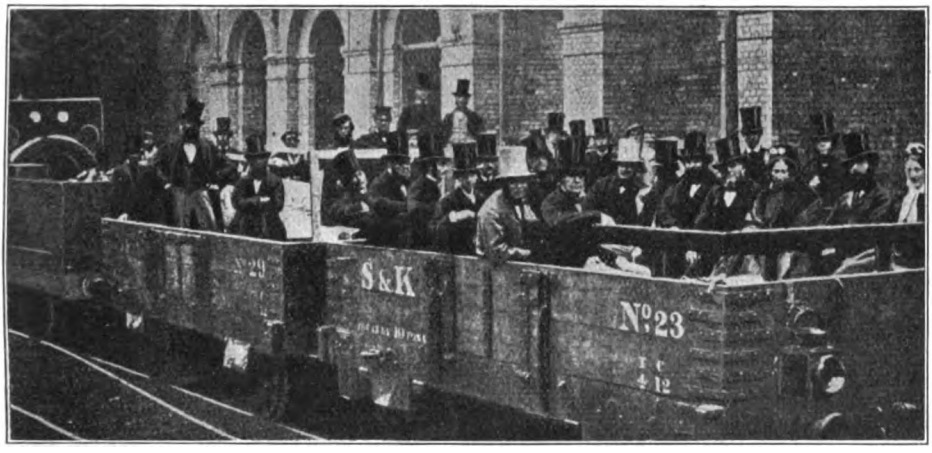
The first installation of automatic signalling was fitted between Praed Street and South Kensington, on a system devised by the railway's officers under the supervision and control of Mr. William Willox, M.A. then the Chief Engineer.

Under this system the trains signal their passage by means of treadles and train contacts, but for the heavier traffic of the Aldgate-Praed Street section it was arranged to use an all-electric system designed by the McKenzie and Holland and Westinghouse Power Signal Co., Limited, depending upon track circuits for signalling of the trains. So far as the main features were concerned, the system was the same as that already in vogue on the Metropolitan District and other London electric railways, but, instead of using compressed air to operate the motors which actuated the signals and points under electric control, everything was done by electricity. The McKenzie, Holland & Westinghouse Power Signal Company, Limited, now is associated with the Westinghouse Brake & Saxby Signal Company, Limited.

By the end of 1909 the automatic equipment of the whole of the Inner Circle was completed—by electro-pneumatic apparatus from South Kensington to Aldgate *via* Mansion House, by all-electric apparatus with track circuits from Aldgate to Praed Street Junction, and by the Metropolitan Railway apparatus on the remaining portion.

Then came the turn of the extension line. Growing traffic made automatic equipment a prime necessity. On this section it was decided to employ a developed form of the McKenzie, Holland and Westinghouse apparatus, but with an important change, and from January 1911, except at Baker Street station then undergoing reconstruction, automatic signalling was in force down to Neasden, and the semaphores were of the "upper quadrant" pattern—that is to say the arms moved upward, instead of downward, to indicate "line clear." At the time of their installation they were unique so far as British signalling was concerned.

From a paper read recently by Mr. Willox before the Institution of Civil Engineers, it may be gathered that when electric trains began to run on the Metro-



TRIAL TRIP IN 1863.

In truck No. 23 will be seen Mr. W. E. Gladstone, afterwards Prime Minister. On the opposite side is Mrs. Gladstone.

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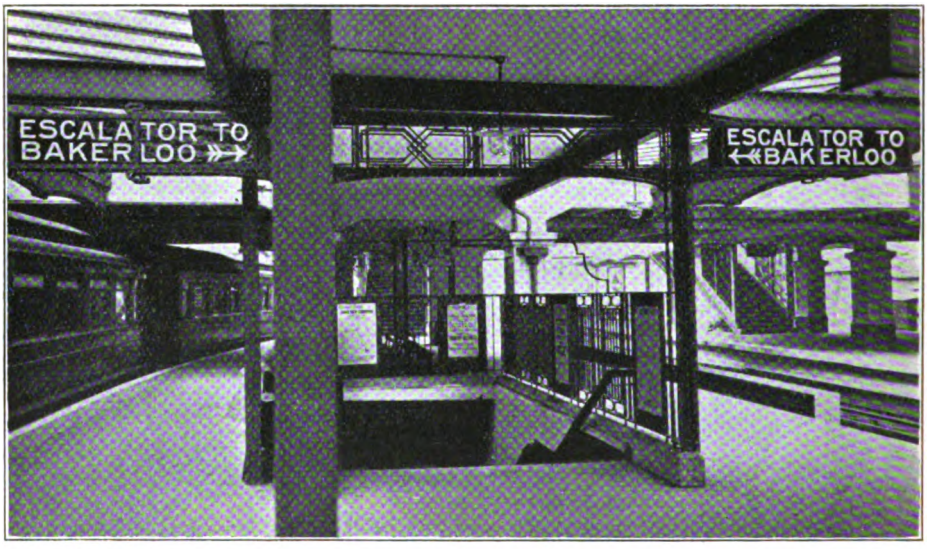
politan Railway in 1905, the system of signalling was mechanical, controlled by Spragnoletti lock-and-block. Trains per day on both roads between Praed Street Junction and Aldgate—about 5 miles—were then 621, and the number of signal sections 49. Then came the introduction in 1909 of the automatic signalling as before described, and in 1913 at Praed Street Junction the number of trains was 863, from Baker Street to Aldgate 983, and the number of signal sections 91.

At the present time there are about 20 hours daily of continuous passenger traffic, but between the hours of 7.30 and 10 a.m. and 4.30 to 7.30 p.m. the traffic necessitates 40 booked trains each way to and from the City per hour. Automatic signalling solves the problem.

When similar signalling was installed between Baker Street and Neasden in 1911, the number of signalling sections was increased from 24 to 51. At that time there was only one through line at Baker Street dealt with by two signal boxes, one at the north end of the station and the other at the circle end. This through line was track circuited and full protection was afforded to train movements allowing 48 through passenger trains to run to and from the City daily.

Metropolitan Railway locomotives (steam and electric) and passenger rolling-stock are up to date and adequate. On December 31, 1921, the company owned 38 steam tank engines made up of the following classes:—0-6-4, 4; 4-4-0, 13; 0-4-4, 7; 0-6-2, 4; 0-6-0, 2; 4-4-4, 8. Passenger carriages to the number of 88 provided seating capacity for 5,852 first and third-class passengers and the Company had in stock a total of 22 other coaching vehicles of various kinds. For the trains worked by electric power the Company had 20 electric locomotives; 167 motor coaches and 332 trailer coaches.



MODERN BAKER STREET STATION.

An interior view.

Carrying capacity of the electric stock is recorded as 24,107 first and third-class passengers.

From the foregoing it will be seen that 13 of the old characteristic Metropolitan 4-4-0 type steam locomotives still remain. Some of them have been fitted with cabs. They are mostly used for goods work. Of the newer standard 0-4-4 type there are now only seven employed, and they work some of the services beyond Harrow. There are no 2-4-0 engines left, although as recently as the year 1920 there were three in service. For heavy goods trains to Aylesbury and Verney Junction the four 0-6-2 engines and four 0-6-4 locomotives

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are used, while the two 0-6-0 engines have their uses as shunters.

Of the 4-4-4 type the Metropolitan possesses eight locomotives, four having been added to the stock during 1921. These eight 4-4-4 tank locomotives became necessary owing to the growing needs of the traffic on the extension line to Aylesbury, and in view of the addition of new heavy rolling-stock for the principal trains. They are from the designs of Mr. Charles Jones, the Metropolitan Railway Chief Electrical and Locomotive Engineer.

The stock of 20 electric locomotives is required for haulage over the electrified lines of non-motor rolling-stock such as the Great Western trains between Bishop's Road and Liverpool Street and the City–Metroland through trains. Then there is the merchandise traffic to and from the Farringdon Street goods depôt and occasional milk specials.

Last year, in order to meet the demands of increasing train loads and accelerated timings, it was decided the 20 electric locomotives should be reconstructed at the Barrow Works of Messrs. Vickers, and to that firm the mechanical portion of the work has been entrusted, the electrical equipment being supplied and erected by the Metropolitan-Vickers Electrical Company, under the direction and supervision of the Railway Company's Chief Locomotive and Electrical Engineer before mentioned. At the time of writing the work in connection with 11 of the locomotives has been completed and that of the other nine is in progress.

Leading dimensions of the reconstructed locomotives are: length over buffers, 39½ ft.; length over body, 35 ft.; width of body, 8 ft.; height above rail, 12 ft. 4¼ in.; bogie wheelbase, 9¼ ft.; spacing of bogie centres, 20¼ ft.; total wheel-base, 29½ ft.; diameter of running wheels, 43½ in. There are contained in the two bogies four series-wound traction motors, each of 350 h.p. capacity, making a total of 1,400 h.p. Originally the locomotives had each a capacity of 800 h.p.

ELECTRIC LOCOMOTIVE HAULING TRAIN OF SEVEN COACHES.

High-powered electrical equipment has been installed and arranged on supports in a central position down the cab of each locomotive, terminating in a main switchboard at each end and surrounded by a hand-rail, leaving ample space on either side, thus rendering every piece of apparatus accessible for cleaning and inspection in the sheds. The control is of the "all electric automatic multiple unit type" with sufficient stops in the master controller to allow of easy shunting. Below the electric equipment in the cab are situated two motor-driven vacuum

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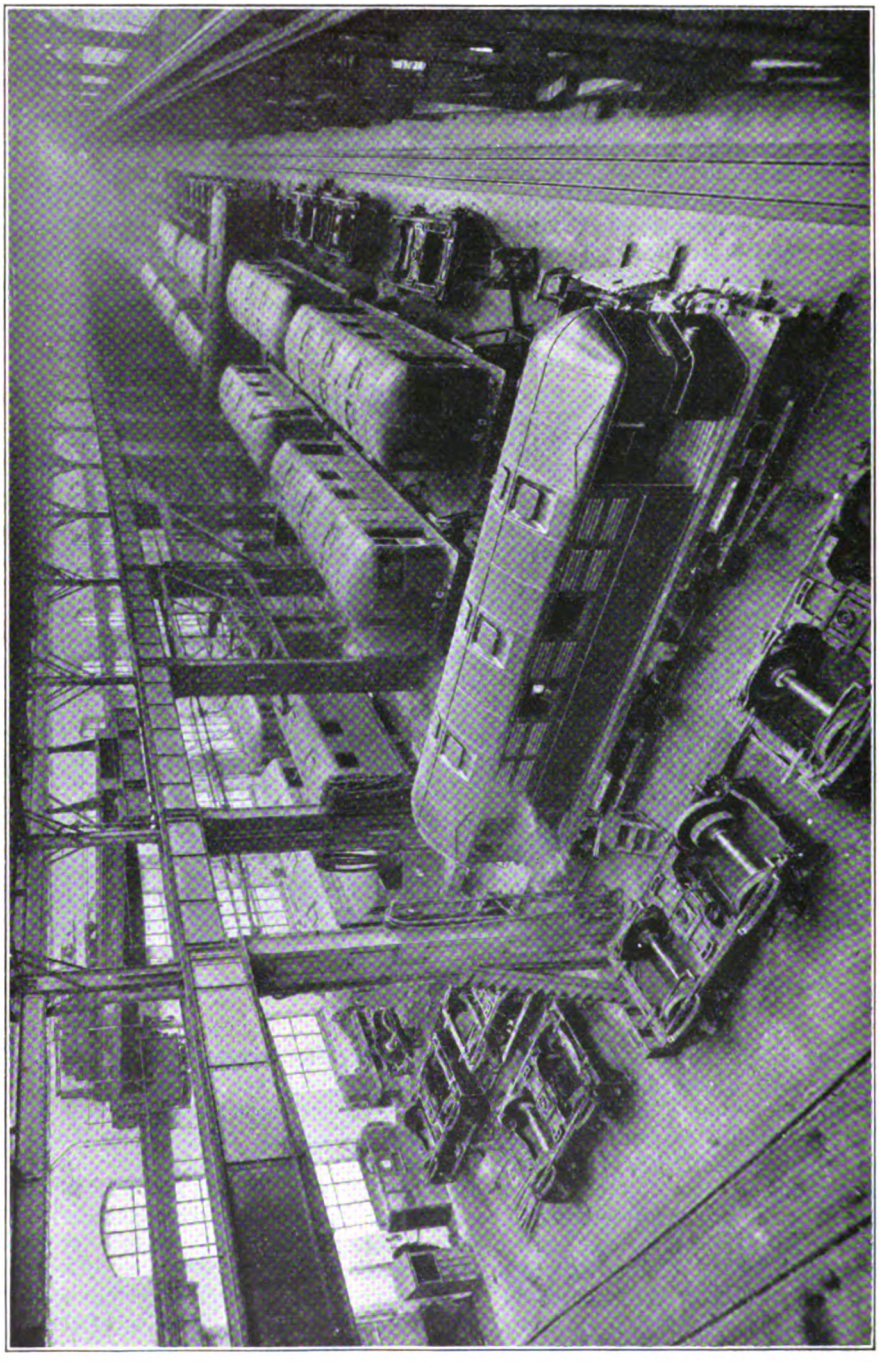

FIFTEEN ELECTRIC LOCOMOTIVES UNDER CONSTRUCTION AT VICKERS' WORKS, BARROW-IN-FURNESS, FOR THE METROPOLITAN RAILWAY.

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exhausters and one air compressor, together with their respective reservoirs.

The Company's standard arrangement of brake tripping device has been fitted with an improved electrical interlocking arrangement as a safeguard, by means of which it is impossible for a driver to set his locomotive in motion without first having the brake apparatus ready for immediate application. Either the vacuum or the air brake apparatus is available for use according to the class of work engaged upon; and to enable the driver to have clear vision in wet weather, an automatic window wiper is fitted so that it may be operated from the inside of the cab.

To give more even haulage and acceleration, each locomotive is fitted with main power positive and negative connectors for coupling up electrically with the passenger rolling-stock which has been provided with through train lines with current collector gear on the first and last coaches. This provision enables the locomotive to collect its current when the collector shoes on the engine itself are bridging gaps in the conductor rails.

As before stated there are four motors contained in the two bogies, each of 350 h.p. capacity (series wound traction type). These are geared to the axles by means of single reduction gearing. The motor is carried on the axle by means of suspension bearings and a portion of the weight is transmitted by means of a nose on the motor casting which rests in a yoke sliding vertically up and down in guides fixed to the truck crossbar. A slight elastic support is obtained by means of rubber cushions.

Running wheels are of the disc centre, having brake blocks acting on both sides of the rim. All pin joints in the brake gear are bushed with renewable bushes and case-hardened pins. Of solid construction, the bogie frames consist of plate frames well stiffened with cast steel corner castings and advantage has been taken of the latter for supporting the brake blocks and levers. Side louvres have been provided in addition to roof ventilators. Altogether it must be said that the workmanship, and the materials, are of the highest class throughout, and conform in every possible way with the latest electric locomotive practice. The rate of acceleration of these locomotives is such that within 25 sec. from a dead stop they can attain a speed of 25 miles per hour. The maximum speed of which they are capable is 65 miles per hour. They can negotiate 3-chain curves and the maximum tractive effort of each is 22,000 lb.

Of the coaching vehicles, other than electric, the stock is gradually becoming smaller. It will be seen on page 174 that the number of passenger carriages on December 31, 1921, was 88, but 12 months previously it was 118. The main line services on the steam lines consist of sets of modern bogie carriages, well upholstered and fitted, that compare favourably with other railways' passenger rolling-stock. Five vehicles form a train, but if traffic is heavy another coach is added. Some of the third class compartments are connected in sets of threes by central openings so that the easy distribution of passengers may be effected at busy times.

For service on the electric lines the passenger vehicles are of the customary open type. At first the electric train stock had open platform gates, but later stock was built with closed vestibules and the older coaches have been similarly adapted.

Every effort is made by the Metropolitan Railway authorities to keep the rolling-stock up-to-date, and they are never backward in experimenting in order to find out what is best for the requirements of the line. Clerestory roofs have been succeeded by the elliptical type, while coaches with end doors only in later types were followed by vehicles with middle doors as well. In 1919, in order to alleviate the congestion in the rush hours, the Metropolitan Railway directors decided on the reconstruction of much of the rolling-stock then in service. It had been found that long passenger vehicles with end doors, even when middle doors were provided, could not be loaded and unloaded with the necessary expedition, if trains were to be run at a rate of 30 to 40 per hour in each direction. In such intensive working seconds are of value, and if more than 24 sec. are occupied at a station in the entraining and the detraining of the passengers, the scheduled number of trains cannot be operated.

As the outcome of experience and careful investigation it has been decided that the most satisfactory electric rolling-stock, particularly in respect to the Inner Circle line, consists of vehicles fitted with three sets of double sliding doors on each side. Before coming to this conclusion, coaches

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with five single doors on each side were put into service, but in practice the vehicles with three double doors have proved superior in lessening the time taken by passengers in passing into and out of the trains. As a consequence the standard coach has become the one with three sets of double doors.

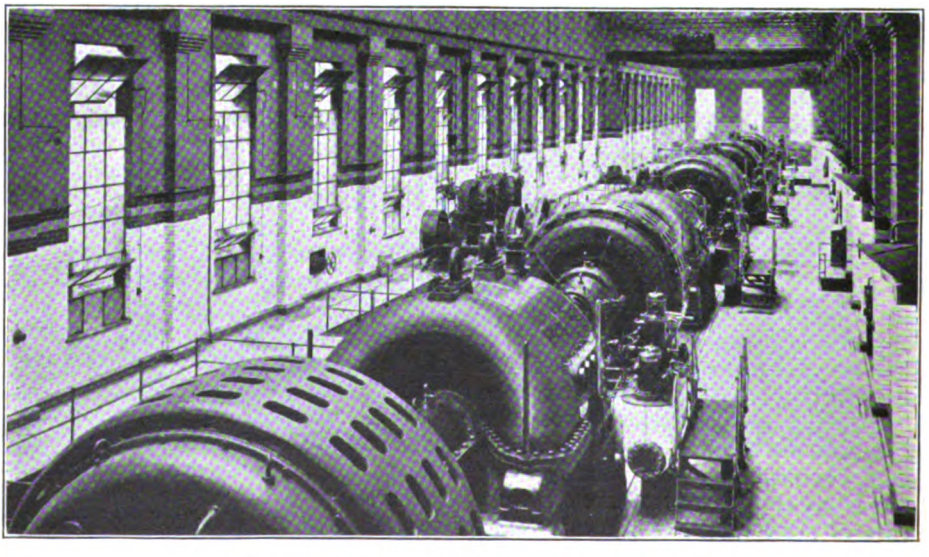
The total length of a standard electric car is 52½ ft. over buffers, height from rail level 12 ft. 4 in. and length between bogie centres 35 ft. The weight of a trailer car is 22 tons, and of a motor-car 46 tons, and there is in each seating capacity for 50 passengers.

These vehicles, as the "last word" in Metropolitan Railway car evolution, provide noteworthy comparison with previously built stock. In their construction the end vestibules of earlier-built vehicles have been dispensed with, and the space thereby obtained used for additional seating accommodation. Seats are fixed transversely on either side of a spacious gangway, with here and there a double seat set lengthwise between.

With a view to obviate "strap-hanging," so much beloved by the professional humorist, and so little liked by the long-suffering Londoner, handrails are fitted on the seat backs. In wintry weather passengers fully appreciate the benefit of the glass screens flanking each door, for these, beside breaking up the car interior into a series of semi-compartments, serve as protectors from discomforting and influenza-producing draughts. The heating, lighting and ventilating arrangements of these standard cars are so adequate and excellent, it seems impossible to improve upon them, but, as there is no finality in invention, one never knows what the Metropolitan Railway may do next, for, to judge by the prevailing policy of recent years, nothing but the acme of perfection will satisfy its ruling powers.

Two Pullman Cars are in service on the Metropolitan Railway and they work on 10 different trains. They were introduced into the service on June 1, 1910, and are named *Galatea* and *Mayflower* respectively. Both vehicles were designed specially to meet the requirements of the Metropolitan Railway's traffic.

An examination of the annual report of the directors of the Metropolitan Railway for the year ended December 31, 1921, provides ample proof of the progressive policy of the Company. The capital expenditure down to the date mentioned was £18,843,885 of which £960,261 was for the electric power station, &c. During the year itself, capital was expended to the extent of £1,140, for the lengthening of the station platforms to accommodate longer trains. Rolling-stock last year



TURBINE ROOM AT NEASDEN POWER HOUSE.

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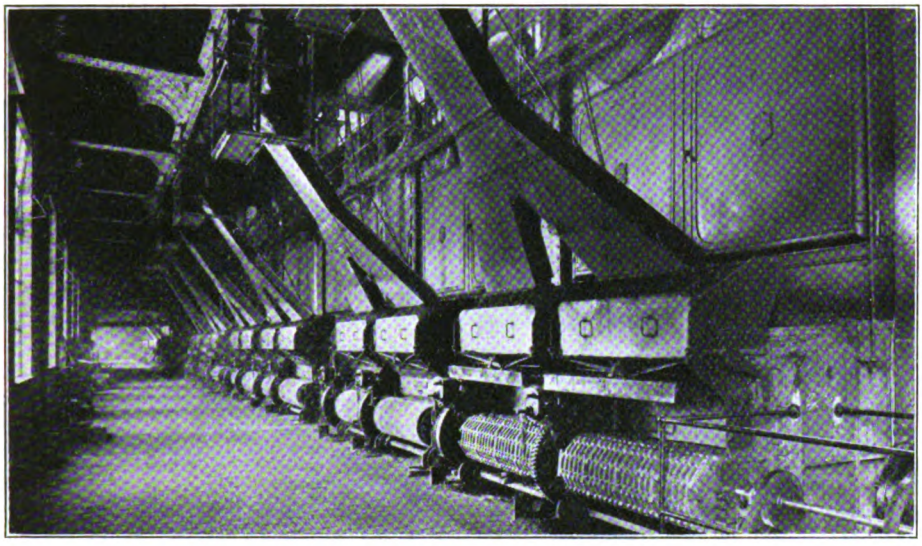

SECTION OF BOILER HOUSE AT NEASDEN.

accounted for the following capital expenditure :—

	£
Locomotives :-	
Proportion of cost of replacing four locomotives ...	9,389
Equipment and rebuilding of electric locomotives ...	39,168
Carriages :—	
Motor coaches	10,000
First-class driving trailer coaches	25,000
Trailer coaches	135,000
Miscellaneous additions and improvements to existing stock	20,442
Wagons :—	
Proportion of cost of heavier Goods Brake Vans ...	893
Total	239,892

Although first and foremost a passenger-carrying railway, the Metropolitan has an important parcels traffic, and to a certain extent has its claim as a goods road, for in 1921 the tonnage of freight traffic originating on or passing over the Metropolitan Company's system totalled 3,510,608 tons.

For the year ended December 31, 1921, the receipts of the Metropolitan including the estimated amount receivable under agreement with the Government in respect of the control of railways for the period January 1 to August 15, 1921, was £2,236,166, and the expenditure £1,727,090, leaving a net balance of £509,076. To this must be added the miscellaneous receipts, which including £50,928 rents from houses and lands carried the total net income of the Company up to £750,946, and a dividend of 2¼ per cent. per annum on the ordinary stock was paid.

RAILWAY MAGAZINE readers, generally, will be aware that the original proposals of the Ministry of Transport as to the grouping of railways were considerably modified, so far as London railways were concerned, in the Railways Act, 1921, as finally passed, and the proposal to form a London group was withdrawn. The Metropolitan Railway therefore remains a separate entity, but is subject to certain of the general provisions of the new Act.

It may be mentioned to supplement the remarks on page 169 concerning the forthcoming British Empire Exhibition at Wembley Park, that the promoters include the provision of a sports stadium, which, by arrangement with the Footabll Association will be used for cup ties and other matches, thus attracting large numbers of visitors and permanently adding considerably to the Metropolitan Railway traffic. But for all such contingencies, and for the normal growth of the traffic, the powers that be are constantly on the alert.

In conclusion a few words on the *personnel* of the railway may be given. The

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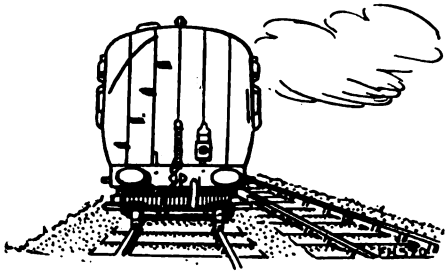
board of directors is under the Chairmanship of the Rt. Hon. Lord Aberconway, P.C. and the General Manager, who is likewise a director, is Mr. R. H. Selbie, C.B.E. Other officers are:—Secretary, W. H. Brown, J.P.; Solicitor, I. Buchanan Pritchard; Engineer: E. A. Wilson, M.Inst.C.E.; Chief Electrical and Locomotive Engineer: C. Jones, M.Inst.C.E., M.I.E.E.; Traffic Manager: W. Holt; Commercial Manager: John Wardle; Accountant: W. M. Ballingall; Stores Superintendent: E. Sutton; and Estate Agent: F. Dawson. All, other than the Electrical & Locomotive Engineer andt he Storekeeper, who are located at Neasden, have their offices at Baker Street Station, N.W. 1.

Mr. Selbie, the General Manager, came to the Metropolitan in 1903 from the Lancashire and Yorkshire Railway. His first position was that of Secretary, but he became the General Manager in October 1908, and he has proved himself a past master in the art of railway management. His remarkable ability has received recent appropriate recognition by the offer, and his acceptance, of a seat on the Board of Directors.

Mr. Willis Holt, the Traffic Manager, has had an experience as varied as it is valuable. He began in the Great Western service in 1883, but left in 1907 to become Superintendent at Perth general station, which belongs jointly to the Caledonian, North British and Highland Railways. He came to his present position in January, 1909.

Like his General Manager, Mr. John Wardle, the Commercial Manager, began railway life in the service of the Lancashire and Yorkshire Railway. In 1900 he became an assistant to the Secretary of the Grand Trunk Railway of Canada and London Traffic Manager of the same railway; then after these and other experiences he entered the service of the Metropolitan Railway and soon became its first Commercial Manager. When times are strenuous and there is big work to be done, Mr. Wardle is in his element. His war record as set forth in the "Railway Year Book" is both distinctive and illuminating.

In Mr. Charles Jones, the Electrical and Locomotive Engineer, the Metropolitan Railway possesses a capable and progressive officer. In fact, if the list is gone through *seriatim*, it will be seen that the railway in question is singularly well served by its leading officials. Mr. Selbie, the General Manager, has by the selection of his co-adjutors proved himself as fine a judge of character, as he is at home in his capacity as the premier officer of the railway that serves so excellently the throbbing heart of the great metropolis, as well as the expansive health-giving lung of London that lies to the north and west of busy Baker Street, which has been aptly termed Metroland and is known under that name to millions of Londoners.



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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A.M.Inst.T., A.I.Loco.E.

Photo.] MIDLAND RAILWAY. [*Henry L. Salmon.*

Cromer to Leicester train near Syston.
4-4-0 locomotive, No. 333.

A FEW words must be said, first of all, on the summer time-tables, before I pass to some recent experiences of performance on the Southern lines. Although speed in general over long-distance routes still falls short of pre-war standards, yet in particular instances it is beginning to rise above the best figures that were offered before the war. The first accompanying table will make this clear. On no fewer than five daily start-to-stop runs average speeds in excess of 60 miles an hour now are required, and if we lower the figure merely to 59·7 instead of 60, we add four more. The total number in excess of 58 m.p.h. amounts to exactly 20, but as in this figure two trains—the 11 a.m. and 1 p.m. out of Paddington—appear twice, in virtue of the coaches slipped at Bath on both runs, the net total is 18.

Four railways are concerned in making these records, the Great Western being responsible for six, the London and North Western and Great Central for five each, and the North Eastern for two, including the fastest in the table, which only beats the fastest Great Central run by a point or two in the second place of decimals, calculating from exact chainages. The North Eastern train is now considerably heavier than was the corresponding express in pre-war days; it consists of a seven-coach corridor set, including the heaviest 8-wheeled dining car I have yet seen (weighing 41½ tons), with a Great Central Railway bogie van on the rear, and the full load is thus about 250 tons. I travelled by it on the second day after the acceleration, with "Z" class 3-cylinder "Atlantic" No. 716 as the engine, but beyond a brilliant start out over the 2·6 miles from Darlington to Croft Spa in 4 min. 30 sec., little or no attempt was made to keep time, and with speed at no point exceeding 64½ m.p.h., we actually took 47 min. 5 sec. to York, on a perfectly fine evening—a feeble exhibition.

By the speeding-up of the 1 p.m. *ex*-Paddington, the Great Western Railway now has four daily two-hour trains between London and Bristol; the two down expresses both travel *via* Bath, where coaches are slipped, and of the two up trains, both *via* Badminton, the 5 p.m. up now adds a Swindon slip to the existing Reading slip. This does not mean a slack at Swindon as well as that at Reading, as the Swindon coach is detached in the centre road, and afterwards brought by a horse (!) to the platform. Additions to the Birmingham service now give the Great

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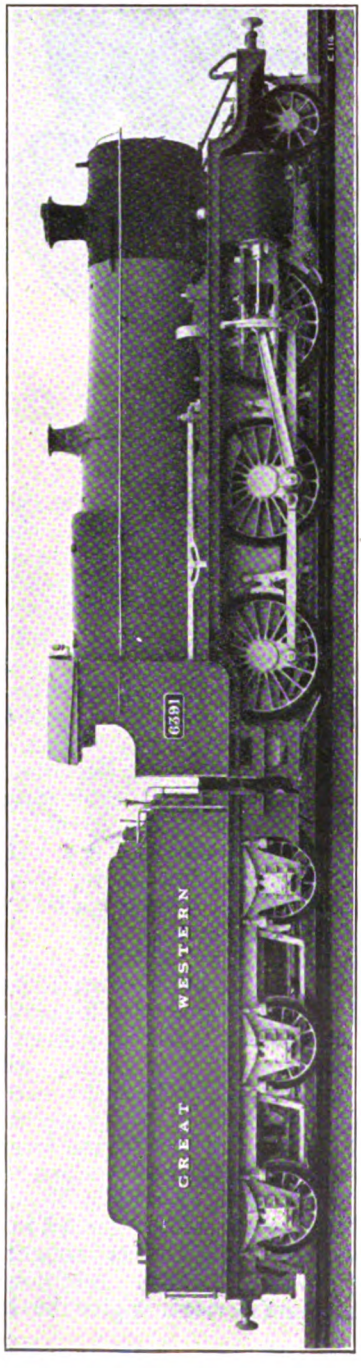
Western ten daily two-hour expresses between Paddington and Snow Hill, of which eight call intermediately at Leamington, while four other expresses make additional calls, in two cases at Banbury and in two at Wycombe, and take only 5 min. more. The same time is occupied by the down North Wales "special" running by the longer Ealing route and calling at Broadway. In other directions, while well up to its usual level of excellence, the Great Western Railway summer time-table contains few novelties, other than a non-stop run in each direction over the 199·7 miles between Paddington and Torquay in 215 min., and a vast improvement of the communications between Reading and the West of England, both by stops and slip coaches.



GREAT WESTERN RAILWAY 2-6-0 MIXED-TRAFFIC LOCOMOTIVE, BUILT BY ROBERT STEPHENSON & CO. LTD., DARLINGTON.

The principal innovation in the London and North Western table is the new 6.30 p.m. down Manchester express. The run from Euston to Wilmslow is without intermediate stop, in 196 min. for the 177 miles, but then, alas! from arriving at Wilmslow to reaching London Road, *forty-six minutes* are to be consumed, lest the "four hours minimum" be infringed. For fourteen minutes the London Road portion stands at Wilmslow, an even half-an-hour being allowed for the subsequent 11½ miles' run. The 10.30 a.m. down has to fill in *thirty-two* minutes in the same way, when the time actually required, including the duration of the stop to detach, is something like 16 or 17 min. That is to say, the two trains concerned are all but 3¾ and 3½ hours' expresses from London to Manchester. In the case of the 6.30 p.m. down, the first portion continues from Wilmslow to Stockport, stops there, and is then taken right round the circuitous route to the Victoria Station, but also arrives at the same time of 10.30 p.m.

It is devoutly to be hoped that, when grouping is a *fait accompli*, such results of inter-railway agreements as these, which badly hamper the evident desire of the London and North Western authorities to give a good Manchester service, will go by the board, to the great advantage of the travelling public. The best London and North Western speed achievements continue to be seen on the Euston-Birmingham services; there are 11 two-hour expresses, of which four now make the Coventry stop, and one a stop at Willesden, and two others in 2 hours 5 min. The Birmingham-Coventry 18·9 miles' start-to-stop run is made by two up "fliers" in 19 min., one in 20 min., one in 21 min., and three in 22 min. The 94 miles between Euston and

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Coventry are run in 99 min. by three up and two down expresses (one of which is the 2.30 a.m. down "Newspaper"), and in the quicker time of 97 min. by the 2.20 and 6 p.m. ex-Euston, which now stop there in the two-hour schedule. A very substantial acceleration is made of the down Fleetwood boat express, which leaves 35 min. later, at 5.20 p.m., and omits the Rugby and Stafford calls, reaching Crewe at 8.21 p.m. non-stop. The 5.20 p.m. down Liverpool is put forward to 5.30 p.m., and calls only at Stafford *en route*, instead of Crewe. Of the long-distance non-stopping trains, the 11 a.m. down North Wales express, with its allowance of 147 min. for the 133·4 miles to Stafford, and the 11 p.m. down night "Scotsman," with 175 min. to Crewe, 158·1 miles, are bringing us very near to the fastest pre-war times.

Trains now run in both directions on the Midland Railway in 5 min. under the four hours between Leeds and London, and the London–Trent non-stop run is made in both directions since the inauguration of the new down Yorkshire express at 6.15 p.m. out of St. Pancras. In self-defen e, the Great Northern Company has at last followed suit as regards Leeds, and has expedited the 9.55 a.m. up to leave Leeds at 10 a.m., and still to reach London at 1.55 p.m. The notable alteration in the Great Northern services is the re-arrangement of the 5.30 and 5.40 p.m. down services; as regards the 5.30 p.m., the suggestion contained in my article of February, 1920, is at last adopted, Doncaster, the "frontier" station, being the first stop, and a North Eastern engine taking charge there for a non-stop run to Darlington. Grantham is passed at 7.30 p.m., and the next 50·5 miles to Doncaster are allowed 56 min., so that the arrival at Doncaster is a minute later than the pre-war passing time, after the train had stopped at Grantham 4 min.; on the other hand the 5.37 p.m. (working time) down Hull, Middlesbrough and Sunderland express is only allowed 120 min. to the stop at Grantham, and 55 min. thence to Doncaster, start-to-stop, equivalent to a non-stopping run of not more than 172 min. from London to Doncaster.

The up 8 a.m. from Newcastle is similarly worked with a North Eastern engine into Doncaster, running non-stop from Darlington to a new stop at Selby. As compared with pre-war times, when the stops south of Darlington were York and Grantham only, this train now calls at Northallerton (conditionally),* Selby, Doncaster, Grantham and Peterborough, and still arrives in

BRITISH EXPRESS RUNS AT 58 M.P.H. AND OVER, START-TO-STOP.

Railway.	Train.	From—	To—	Distance.	Time.	Speed.	No. of Runs.
				miles	min.	m.p.h.	
N.E.R. ..	8.59 p.m.	Darlington	York	44.1	43	61.5	1
G.C.R. ..	4.30 a.m.	Leicester ..	Arkwright St.	22.6	22	61.5	1
G.W.R. ..	11.00 a.m.* / 1.00 p.m.*	Paddington	Bath	106.9	105	61.1	0+2*
G.C.R. ..	5.42 p.m.	Aylesbury	Leicester ..	65.1	65	60.1	1
G.C.R. ..	3.40 a.m.	Brackley ..	Rugby ..	23.9	24	59.8	1
G.C.R. ..	4.06 a.m.	Rugby ..	Leicester ..	19.9	20	59.7	1
L. & N.W.R.	1.00 p.m. / 6.20 p.m.	Birmingham	Coventry ..	18.9	19	59.7	2
L. & N.W.R.	4.50 p.m.	Birmingham	Willesden Jc.	107.5	109	59.2	1
G.W.R. ..	11.00 a.m. / 1.00 p.m.	Paddington	Bristol ..	118.3	120	59.2	2
G.W.R. ..	12.00 noon / 5.00 p.m.	Bristol ..	Paddington ..	117.6	120	58.8	2
N.E.R. ..	1.35 p.m.	York ..	Darlington ..	44.1	45	58.8	1
G.W.R. ..	9.41 a.m.*	Wycombe	Banbury ..	41.0	42	58.6	0+1*
G.W.R. ..	10.30 a.m.*	Paddington	Westbury ..	95.6	98	58.3	0+1*
G.C.R. ..	7.21 p.m.	Woodford	Aylesbury ..	31.1	32	58.3	1
L. & N.W.R.	2.20 p.m. / 6.00 p.m.	Euston ..	Coventry ..	94.0	97	58.1	2

* By Slip Carriage.

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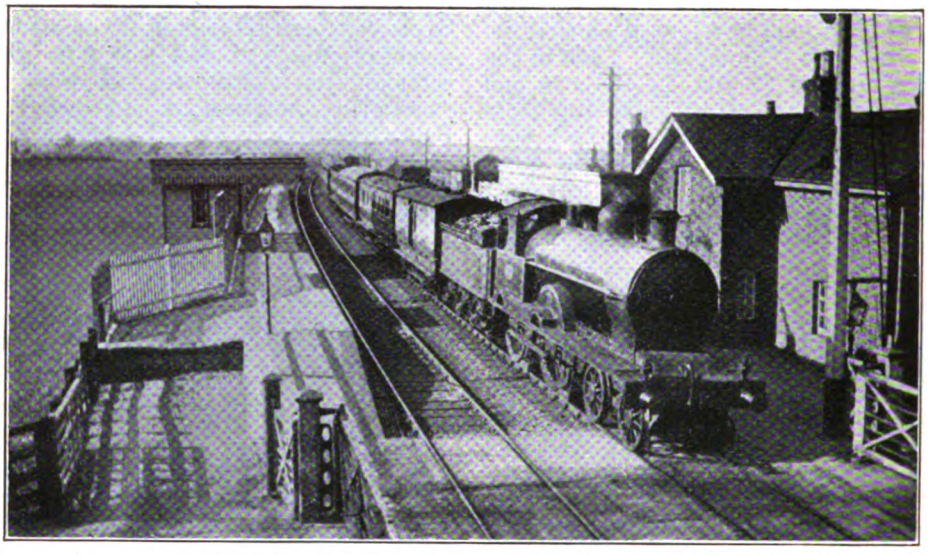

Photo.] LONDON & NORTH WESTERN RAILWAY. [*J. Macartney Robbins.*

Special with Rugby School O.T.C. at Yelvertoft. 4-4-0 locomotive, No. 1510, "Pysche."

King's Cross within 5 min. of its very worst war schedule, and 40 min. later than its pre-war arrival time. At last the companion "562 up" has been improved, leaving Newcastle at 10.20 instead of 10.15 a.m., and reaching London at 4.30 instead of 5 p.m., but even this train is still 38 min. slower than in pre-war days. As regards the Scottish expresses, the relieving "Scotsmen," at 9.50 a.m. down and 10 a.m. *ex*-Edinburgh, are also worked by the North Eastern Railway from and to Doncaster, and non-stop by the Great Northern Railway between Doncaster and London. The down express also is run without a stop between Doncaster and Newcastle, although one might venture to suggest yet again the urgent desirability of stopping this express, with its ample time allowance, at Darlington to connect with the 2.58 p.m. train to Tees-side. Darlington is passed at present at 2.35 p.m., and by making this simple connection passengers for Middlesbrough would be saved 68 min., and for Saltburn no less than 91 min. from London, in addition to avoiding the present necessity of changing themselves and their luggage at York and Northallerton and Eaglescliffe.

A result of the present poor morning service is that Tees-side passengers from London nearly all now crowd themselves on to the 1.20 p.m. down, which has an excellent connection at Darlington, and is in consequence uncomfortably full and often a very heavy train, as far as that point. Talking about Tees-side connections, by the way, I recently came up from Stockton-on-Tees to London, leaving by the 11.18 a.m. Leeds express, due there at 12.53 p.m., and on to London by the Midland 1 p.m., due St. Pancras at 5.30 p.m.; the ordinary mid-morning East Coast connection left at 9.58 a.m., and was due at King's Cross at 5 p.m., so that I saved a clear 50 min. This summer's greatly needed acceleration of the latter, however, would now cut this gain to 20 min. Of purely North Eastern services, the re-instatement of the 75-min. Leeds–Scarborough expresses, over a 67½-mile route with a number of severe service slacks, especially that through York, is very welcome, and a 50-min. timing over the 42 miles of the branch, from Scarborough to York, also reappears.

Great Central changes include the remarkable 60·1 m.p.h. schedule of the new 4.55 p.m. down Mansfield express, as between Aylesbury and Leicester, and the speeding-up to exact pre-war running times (save for slight increases in the duration of stops) of the lightning down "newspaper" at 2.32 a.m. from Maryle-

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bone. Why the odd "2," by the way? It greatly intrigues me, at such an hour in the morning! The new up morning Mansfield express, due at 11.10 a.m., adds another 112-min. non-stop run from Leicester. *Apropos* Eastern group arrangements in general, one would think it possible to run some good through services between Liverpool, Manchester, Sheffield and Newcastle-on-Tyne, on Eastern group metals entirely; the existing trains are at present well arranged in groups, with the various through North Eastern-*cum*-Great Central trains between Sheffield and York as the connecting links. Very slight adjustments in times would be necessary to make the through workings possible—the 4.45 p.m. express from Liverpool to Hull, for example, reaches Sheffield just *one minute* after the departure of the Bournemouth-Newcastle through train, and the two together would save three-quarters-of-an-hour on the present London and North Western connecting train from Liverpool to York—with the additional advantage of restaurant car accommodation over part, if not the whole, of the journeys of the trains concerned. I commend the suggestion to the authorities concerned.

Among other railways, the Great Eastern has again a real summer service, with six 100-mile "breaks" daily—London–North Walsham, London–Yarmouth and London Beccles, all in both directions—and all vestibuled trains this year; in fact, in proportion to its route mileage and the general character of its traffic, the Great Eastern daily figure of 64 independent trains carrying restaurant or Pullman cars, or both, in their formations, is a really extraordinary one. The increase in the weight of the leading expresses thereby occasioned, as compared with pre-war days, is amply enough to account for increases in the timings of some of the long runs, the pre-war 150-minute London–Yarmouth time being now expanded to 162 min. down and 160 min. up, while the North Walsham non-stops, still of about their pre-war weight, take 165 min. in each direction, in place of 158 min. down and 159 min. up. The up evening non-stop from Beccles brings a daily booked load of 14 corridor bogies—a formidable proposition over the East Suffolk line. The summer novelties are chiefly the Sunday non-stop "Clacton Pullman" expresses, in 97 min. down and 95 min. up, and the reinstatement during the season of a St. Pancras–Hunstanton restaurant car express, calling only at Cambridge, Lynn

Photo.] SOUTH EASTERN & CHATHAM RAILWAY. [*F. E. Mackay.*

Down Continental Pullman Car Express. Rebuilt superheated 4-4-0 locomotive, No. 163.

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and Heacham in each direction; in all four cases the end-to-end times are better than anything operating before the war. I may add that I hope to devote a long overdue article to Great Eastern performance next month, including some remarkable journeys on the Continental expresses, and especially two simply staggering trips on both of which, with a 59-axle load of fully 420 tons, we actually gained time on this terribly hard 82-min. booking.

Elsewhere there is not much of summer innovation to note, save on the South Eastern and Chatham and London and South Western Railways, several journeys such idyllic conditions. It is, of course, somewhat difficult for me to conceal from a driver my presence on the train when I am travelling with him on the footplate, and I daresay there is a little "abnormality" in the work in these circumstances; but I hasten to add that, in the trips about to be described, no special arrangements were made—neither are they ever made, without I specially mention the fact when describing the run—nor were *any* of the drivers concerned aware that I was travelling behind them. Furthermore, *every* trip is mentioned, and no mediocrities are concealed.

The bulk of the South Eastern and

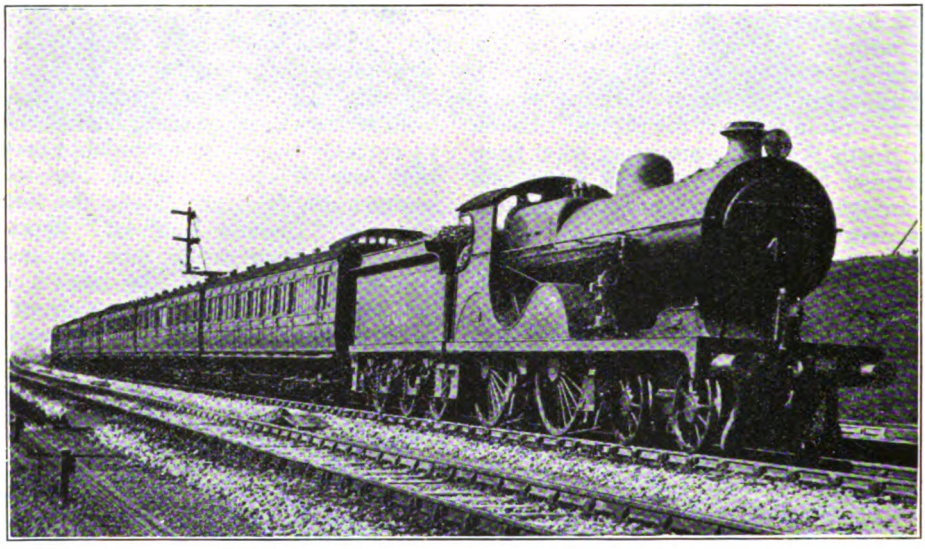

Photo.] SOUTH EASTERN & CHATHAM RAILWAY. [*F. W. Curtis.*

Down Folkestone express. Large 4-4-0 locomotive, No. 766.

over which lines, with the aid of facilities courteously supplied by their respective General Managers—Mr. P. C. Tempest, C.B.E., and Sir Herbert Walker, K.C.B.—receive attention later or next month. May I at this stage correct an impression, which I appear to have given to one reader at least, that the term "facilities" is not all-inclusive enough to cover special engines, special drivers and a specially cleared road. The reader in question charged me with having given him quite a false impression as to London and South Western performance in previous articles, on the altogether erroneous assumption that every journey that I make is under Chatham running I found to be really noteworthy. What is now demanded of the engines is made clear in the schedule times found in the annexed table. Practically "even time" is required in the start of the up 80-min. Folkestone expresses from there as far as Tonbridge—40½ miles in 41 min.—and in the reverse direction 44 min. for the 42·4 miles from Sevenoaks to Sandling includes the bad Tonbridge slack. These timings are practically shared between Orpington and Folkestone by the Flushing boat expresses, which, when unpiloted, are limited in weight to 175 tons, the ordinary unpiloted boat train limit being 300 tons tare. There are, in all, five

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daily runs over the 26·5 miles between Tonbridge and Ashford in from 28 to 31 min., start-to-stop, all thus at over the 50 m.p.h. level, and two others from Ashford to Paddock Wood, 21·3 miles, in 24 and 25 min.; two runs over the 19·5 miles from Red Hill to Tonbridge in 22 a total of 18 daily start-to-stop runs booked at over 50 m.p.h.

The first run in my table was on the down Flushing boat express, leaving Victoria at 8.30 a.m., and lightly loaded on the day I travelled. Nothing in the way of speed was attempted over

S.E. & C.R. LONDON–FOLKESTONE–DOVER.

506 R.S. 135/145		Distance.	761 L.S. 200/220		Distance.	Engine 4-4-0 No.: {Load, tons / tare/full.}	Distance.	761 L.S. 197/215		Distance.	315 N.W. 300/315	
Sched.	Actual.		Sched.	Actual.				Sched.	Actual.		Sched.	Actual.
Min.	M. s.	Miles.	Min.	M. s.	Miles.		Miles.	Min.	M. s.	Miles.	Min.	M. s.
—	—	—	0	0.00	0.0	Charing Cross ..	70.0	80	80.10	—	—	—
—	—	—	5	4.25	1.8	London Bridge ..	68.2	75	75.20	—	—	—
—	—	—	9	8.25	4.9	New Cross ..	65.1	71	71.05	—	—	—
—	—	—	12	11.15	7.1	Hither Green ..	62.9	68	68.15	—	—	—
—	—	—	18	17.20	11.2	Chislehurst ..	58.8	64½	64.40	—	—	—
0	0.00	0.0	—	—	—	Victoria	—	—	—	78.0	110	110.30
—	3.15	1.2	—	—	—	Battersea Pk. Rd.	—	—	—	76.8	—	108.05
8	7.20	4.0	—	—	—	Herne Hill ..	—	—	—	74.0	103	103.55
—	10.30	5.7	—	—	—	Sydenham Hill ..	—	—	—	72.3	—	101.20
15	15.00	8.7	—	—	—	Beckenham Jc.(*b*)	—	—	—	69.3	95	95.05
20	20.50	12.6	—	—	—	Bickley Junc. ..	—	—	—	65.4	90	89.45
24½	24.45	14.9	21	20.45	13.8	Orpington ..	56.2	61½	62.20	63.1	86	86.55
—	28.40	17.6	—	24.20	16.5	Knockholt ..	53.5	59½	59.40	60.4	83	83.50
—	33.05	21.6	—	28.30	20.5	Dunton Green ..	49.5	—	55.05	56.4	—	77.50
35	34.35	23.1	31	29.55	22.0	Sevenoaks ..	48.0	53	53.30	54.9	76	75.55
—	40.10	28.0	—	34.45	26.9	Hildenborough ..	43.1	—	45.45	50.0	—	65.00
43	43.30	30.6	38½	37.05	29.5	Tonbridge (*a*) ..	40.5	41	41.55	47.4	62	60.20
49	49.35	35.9	44½	42.45	34.8	Paddock Wood ..	35.2	36	36.25	42.1	54	54.05
—	53.45	40.5	—	47.25	39.4	Marden (*c*) ..	30.6	—	31.50	37.5	—	49.10
—	56.50	43.0	—	50.35	41.9	Staplehurst ..	28.1	—	29.15	35.0	—	46.35
59	59.50	46.3	54	53.45	45.2	Headcorn ..	24.8	—	26.20	31.7	44	43.30
—	64.50	51.6	—	59.10	50.5	Pluckley	19.5	—	21.50	26.4	—	38.35
70	70.00	57.2	65	64.45	56.1	Ashford	13.9	16	16.45	20.8	33	32.35
—	74.10	61.5	—	69.20	60.4	Smeeth	9.6	—	13.05	16.5	—	28.20
—	78.05	65.2	—	73.30	64.1	Westenhanger ..	5.9	—	9.25	12.8	—	24.05
80	79.40	66.5	75	74.55	65.4	Sandling Junc. ..	4.6	7	7.55	11.5	23	22.10
—	84.00	70.4	—	78.35	69.3	Shorncliffe ..	0.7	—	2.10	7.6	—	15.45
—	84.50	71.1	80	79.40	70.0	Folkestone C. ..	0.0	0	0.00	6.9	—	14.35
88	87.30	72.2	—	—	—	Folkestone Junc.	—	—	—	6.0	14	12.55
—	—	—	—	—	—	Dover Marine ..	—	—	—	0.0	—	0.00
88	84	72.2	80	78	70.0	Net times (min.)	70.0	80	78½	78.0	110	106½

R.S. Rebuilt Superheater., Class E1. L.S. Large-boilered superheater. N.W. Non-superheated Wainwright type, Class E.

(*a*) Service slack. (*b*) Rebuilding underline bridge, severe slack.
(*c*) Rebuilding underline bridge and p.w. relaying, severe slack.

min., and another through to Ashford, 46 miles, in 53 min.; Faversham-Margate, 21·9 miles, is covered by three daily trains, in both directions, in 26 min.; and there are, of course, the four Charing Cross–Folkestone 80-min. runs, and the 86-min. run from Folkestone Junction to Victoria of the Flushing boat express, to complete the difficult switchback out to Orpington, and when we had got over Knockholt summit, the downhill running to Tonbridge was most unusually restrained, as is clear by comparison of the times with those of the next run. Yet we passed Tonbridge, at a most carefully reduced speed, and despite the check at

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Beckenham, within ½-min. of schedule. After this, however, we got away in tremendous style, and down the very gradual incline to Paddock Wood worked up to 72½ m.p.h., which rate was being well sustained, practically on the level, when we slowed up to 15 m.p.h. for the Marden check. From this again we recovered with great rapidity, and were doing 58½ m.p.h. at Staplehurst, 67 at Headcorn, 64½ at the top of the subsequent rise and 69 at Pluckley, 64 at the top of the Pluckley rise (even though this finishes with 1¼ miles at 1 in 200) and 69 sustained through Ashford. Up the rise beyond Ashford, extending to beyond Westenhanger and mostly at 1 in 259–266, we were within almost a mile of the summit and going at 58½ m.p.h., when the driver, despairing—as Alexander might have done had he been a modern engine-driver—because of no more checks "to conquer," suddenly eased his engine, so that we fell to 46 m.p.h. Nevertheless, we stopped in the siding beyond Folkestone Junction, preparatory to running down to the Harbour, nicely inside schedule time. We had covered the 29·3 undulating miles from Paddock Wood to Westenhanger, Marden check included, in exactly 28½ min., and not more than 27 min. net, a fine example of sustained high-speed travelling on the part of Mr. Maunsell's re-built engine.

On the 4.5 p.m. down Folkestone 80-min. express, in the next column, we had one of the large-boilered engines, No. 761, and enjoyed another splendid trip. Notwithstanding very careful running round the curves to London Bridge, we had time well in hand all the way up to Knockholt, falling only from 45 to 37½ m.p.h. up the 3⅜ miles at 1 in 140–120 from Hither Green to Elmstead, nor below 41 up the 3 miles at 1 in 120 to Knockholt, with an intervening maximum of 48 m.p.h. at Orpington. Then came a "hurricane" descent to Tonbridge, with a top speed of 69 m.p.h. at Dunton Green, a minimum of 53 at Sevenoaks Tunnel, and a sustained 76½ m.p.h. below Hildenborough, which carried us through Tonbridge 1½ min. early. Regaining speed after the slack, which was less severe than on the preceding journey, we passed Paddock Wood at 65 m.p.h., and then were again pulled up at Marden. After that speed ranged between 65 m.p.h. at Headcorn and Ashford down to 55 at the top of both the two gentle intermediate ascents, and the minimum beyond Westenhanger as 53 m.p.h. Finally, with a maximum of 65 m.p.h. at Cheriton, we reached Folkestone in 79 min. 40 sec., or about 78 min. net. Thus the accelerated booking clearly offers no difficulties to modern South Eastern and Chatham engines and their crews.

The same engine was at the head of the train on my journey up on the 11 a.m. express from Folkestone, and with a 215-ton train (the substantial allowances in respect of passengers and luggage on these trips result from the well-filled non-corridor stock in use), accelerated finely up the continuous 1 in 264 to beyond Sandling, at the summit of which speed had risen to 48½ m.p.h. On the subsequent similarly graded descent, we were doing 70½ m.p.h. at Smeeth and 72½ at Ashford; we further passed Pluckley at 71½, Headcorn at 72½ and Staplehurst at 69, with intervening minima of 64½ and 66 m.p.h. respectively at the head of the two rises after Ashford and Pluckley. This was quite a thrilling experience, and with the 21 miles from Smeeth to Marden covered in 18¾ min., it is obvious that "even time" would have been attained before Tonbridge, but for the Marden slack, which cost us about 1½ min., or a shade over. Recovering well from Tonbridge slack to 44 m.p.h. on the mile of level beyond, we breasted the 4 miles at 1 in 122 to Sevenoaks Tunnel entrance without speed falling below 37½ m.p.h., and then maintained that speed unvaryingly through the two miles at 1 in 144 of the tunnel itself, thus gaining time on the schedule allowance up to Sevenoaks. At Dunton Green we touched 62½ m.p.h., and at Knockholt Summit, after an ascent concluding with 2 miles at 1 in 143, partly through Polhill Tunnel, and ¾ at 1 in 170, we were doing 46½ m.p.h., and so had fully regained the loss of time at Marden. Knockholt to Orpington, 2·7 miles, in 2 min. (= 81 m.p.h.) is obviously somewhat of a "counsel of perfection"—this is the only blemish, and a very minute one, that I have discovered amidst all the eminently practical and workable times, both uphill and downhill, contained in the South Eastern and Chatham working time-book,

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for the whole arrangement of which Mr. E. C. Cox, the Superintendent of the Line, deserves warm congratulation—but with speeds ranging between 65 and 71½ m.p.h. down to Hither Green, where we slacked carefully and continued so to run on to Charing Cross, we kept closely to booked times, and completed the journey in 10 sec. over 80 min., or 78½ min. net.

The last of the tabulated runs was made on the second portion of the afternoon Calais boat express, leaving Dover Marine at 5.55 p.m. The train was made up with seven of the really magnificent new vestibuled vehicles now used on this service, tons, the acceleration was again steady and constant to the summit, where speed had risen to 37½ m.p.h., and a gain of nearly a minute on schedule had been achieved. Little advantage was taken of the falling grades on to Ashford, where we did not exceed 62½ m.p.h., but after falling to 53 m.p.h. on the short rise after Ashford, we actually got up to 68 m.p.h. on the very slight gradient down to Headcorn—a remarkable feat for an engine of this type, so loaded. Thus we covered the 21 miles from Smeeth to Marden in 20 min. 50 sec., and, despite the slack at the latter place, passed Tonbridge with nearly 1¾ min. in

Photo.] **SOUTH EASTERN & CHATHAM RAILWAY.** [*E. A. Gurney-Smith.*

Down express near Orpington. Large 4-4-0 locomotive, No. 779.

together with two 12-wheeled Pullmans, and the tare weight of the whole was precisely the 300 tons maximum allowed to an unpiloted engine. In this connection it may be recalled that no heavier engines than the Maunsell rebuilt and superheated Wainwright 4-4-0's may work on these trains, on account of running over the Chatham section between Bickley Junction and Victoria. On this occasion, however, the engine was an un-rebuilt Wainwright 4-4-0, No. 315, the running on that account being even more entertaining. The gradient from Folkestone to Sandling, previously mentioned, begins at Dover, but on the ascent, with a full load of 315 hand. These, and more, were expended on the ascent to Knockholt, minima being 26½ m.p.h. as we entered Sevenoaks Tunnel, rising to 28 at the exit and 54 at Dunton Green, and 31 at Knockholt. With a speed of 64½ m.p.h. at Orpington, and careful negotiation of the Bickley Junctions, we were through Beckenham on time, but the bad slack there made us a shade late into Victoria. Nevertheless, in the circumstances, the run was distinctly a good one.

Once again this year I tried the 3.15 p.m. 92-min. express from Victoria to Margate, and once again we failed to keep time, but on this occasion there was some excuse, as

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the train was made up to a 10-coach formation of 284 tons tare weight, and with a crowded passenger complement in what was entirely non-corridor stock of large seating capacity, except the two Pullmans, the gross weight cannot have been less than 315 tons. This was a tremendous load for a 51-ton locomotive to haul at express speed over the formidable gradients of the Chatham route, and our engine—No. 494, rebuilt superheater of Class D1—had in addition to contend with the Beckenham Junction slack, which accounted for between 2 and 3 min. We were banked up the 1 in 61 to Grosvenor Bridge, and passed Herne Hill in 8 min. 35 sec., while the minimum up the 1 in 100 thence to Sydenham Hill, passed in 12 min. 55 sec., was 22 m.p.h. Speed on the subsequent Beckenham "dip" was spoiled by the check, but up the broken grades to Bickley Junction, concluding with 1¼ miles at 1 in 95, we did not fall below 32½ m.p.h. Touching 58½ m.p.h. at St. Mary Cray, we passed Swanley, 17·6 miles, in 31 min. 10 sec., at 47½ m.p.h.; a maximum of 68 m.p.h. at Farningham Road preceded a minimum of 39 on Longfield bank (4½ miles, mostly 1 in 100), and we were through Sole Street, 26·8 miles, in 41 min. 55 sec.

Most of the famous Sole Street bank was traversed at under 50 m.p.h., and, slacking carefully round the curve, we passed Rochester Bridge, 32·9 miles, in 49 min. 20 sec., and Chatham, 34·3 miles, in 51 min. 40 sec., allowed 48 min. Over the easier, but still sharply-graded road beyond Chatham, we rose to 67 m.p.h. at Sittingbourne, but fell to 37½ on Teynham bank (poor work, this, as only a part of the 3 miles are as steep as 1 in 132); so Chatham to Sittingbourne, 10·4 miles, took 12½ min., and from there to Faversham, where we reduced to the abnormally cautious figure of 35 m.p.h., 7·3 miles, 8 min. 10 sec. Over the level to Whitstable we attained 56½ m.p.h., the 10·7 miles from Faversham to Herne Bay taking 12 min. 25 sec., and then, with a minimum of 43½ m.p.h. on the short Herne Bay bank (again rather poor work) and a maximum of 66 beyond, we covered the 11·2 miles from Herne Bay to Margate in 12 min. 55 sec.—total 97 min. 40 sec., or about 95 min. net, from Victoria. The 60·6 miles from St. Mary Cray Junction to Margate stop, including the slow running through Rochester, Chatham and Faversham, were covered with this heavy train in half-a-minute over the schedule allowance of 71 min.

The up journey from Margate to Victoria is, in my judgment, distinctly easier than the down journey, as a good start may be made out to Chatham, and fast running is also permissible from Sole Street well into the London suburban area. So No. 246, of the same type, had a simpler task on the 5.20 p.m., although the 10-coach train scaled almost identically with that of the down journey—283 tons empty and 310 tons full—the up journey allowance being 98 min. We passed Birchington, 3·2 miles, in 6 min. 50 sec.; Herne Bay, 11·2 miles, in 16 min. 5 sec. (minimum 37½ m.p.h., sandwiched between a maximum of 58½ after Birchington and another of 66 through Herne Bay); Faversham, 21·9 miles, in 27 min. 20 sec.; Sittingbourne, 29·2 miles, in 35 min. 20 sec., at 65 m.p.h.; Chatham, 39·6 miles, in 47 min.; and Rochester Bridge, 41 miles, in 49 min. 5 sec., a minute behind time, at the usual reduced speed. A minute was dropped up Sole Street bank, the 5 miles of which 4 are at 1 in 100, bringing our speed down to 28½ m.p.h., and the 6·1 miles up from Rochester Bridge taking exactly 13 min. Seeing that the train was behind time, subsequent work was leisurely, as we did not go above 66 m.p.h. at Farningham Road, nor 61½ at St. Mary Cray, with a minimum of 43½ m.p.h. at Swanley. So we took 10 min. 35 sec. for the 9·2 miles from Sole Street to Swanley, 5 min. 50 sec. for the 5 miles on to Bickley Junction, 5 min. more to Beckenham Junction, where, now only ½-min. late, we encountered the same bad check as previously; 8 min. 10 sec. thence over Sydenham Summit to Herne Hill, with a sustained minimum of 30½ m.p.h. in the tunnel; and 6 min. 50 sec. from Herne Hill into the terminus. This made a total of 98½ min. for the 73·9 miles, or practically schedule time, net time being 96 min. for the journey—a satisfactory but unenterprising sample of performance.

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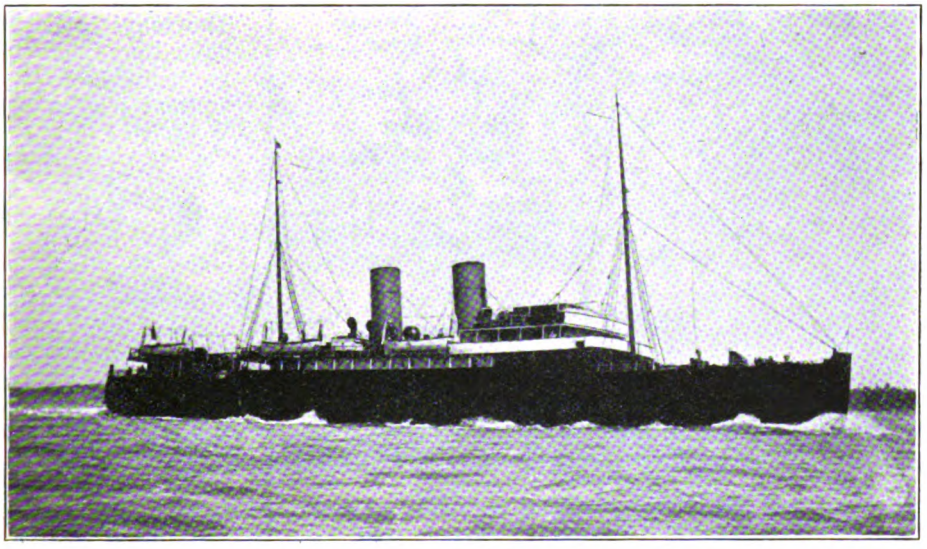
New Tourist Routes to Bordeaux and Spain, through Normandy and Brittany.

By FRANK GILBERT.

AS a result of the enterprise of the London and South Western Railway, and the co-operation of the French State and Midi Railways, arrangements have been made which enable tourists to travel between London and Bordeaux, the Pyrenees and Spain, through the wonderlands of Normandy and Brittany, by alternative routes, and

not speak French; still more who vaguely expect uncomfortable rail travel on the other side, and a greater number who feel that the cost of such a trip is beyond the power of their purses.

These fears are really groundless. A channel crossing is actually an affair quite lacking dangers; the language difficulty need be no bar to spending a pleasant time



LONDON & SOUTH WESTERN RAILWAY TURBINE STEAMSHIP, "LORINA."
1,504 tons gross. 4,748 I.H.P. Length 291 ft. Breadth 36 ft. Speed 20 knots.
The vessel is engaged on the St. Malo service.

avoiding the rather more travelled highways, via Paris.

To find a new holiday ground possessing the merits of accessibility, cheapness and variety of scene is no easy matter, but a brief examination of the facilities described in this article will prove what great attractions they must offer to the holiday-maker anxious to explore fresh fields.

A Continental holiday certainly does provide a complete change of scene and surroundings, but many people still hesitate to cross the Channel—some fearing the sea journey; others because they do

abroad, and rail comfort there reaches a very high level. Many Britishers are now familiar with the battlefields, Paris and the Riviera, but the manifold beauties of Southern and Western France are comparatively unknown. This is a great pity for there is a very real charm about these little visited regions, and the cost of journeying there is indeed very small.

To travel to (say) Bordeaux, from Waterloo, via Cherbourg, through wonderful old Normandy, the smiling valley of the Loire, and that beautiful wine-producing country around Bordeaux, and return-

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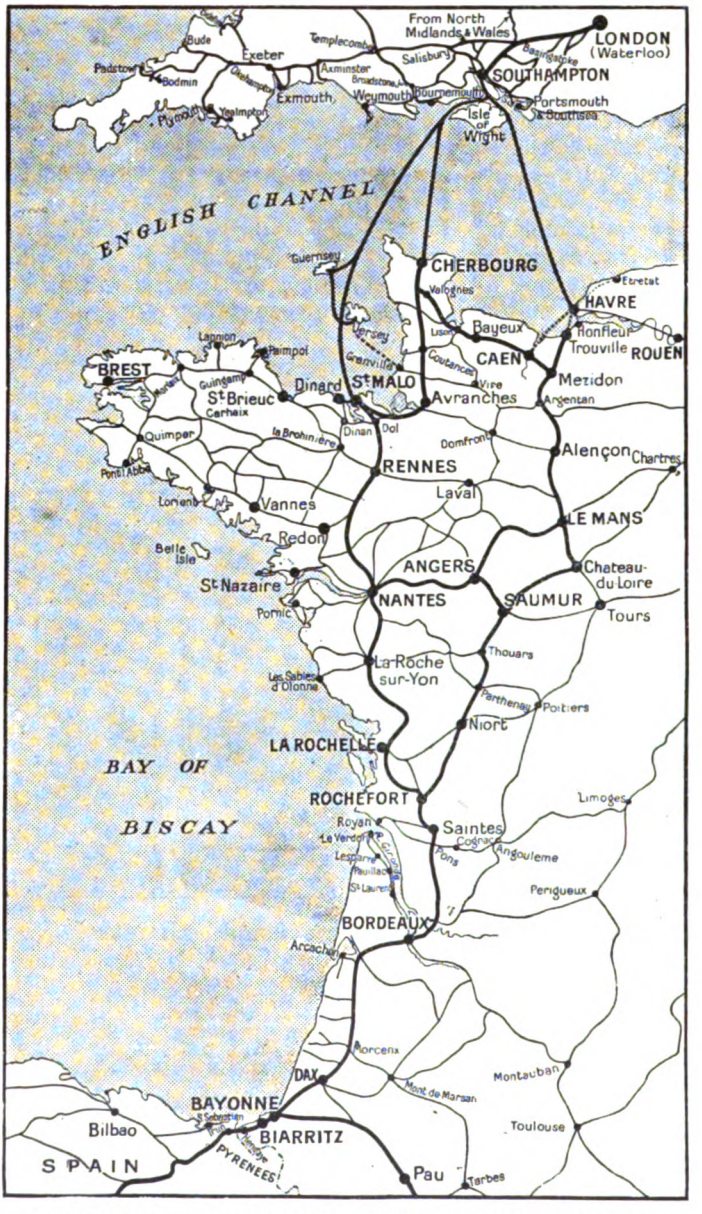
ing by another route, through towns teeming with historical memories like La Rochelle and Nantes, and the many quaintly picturesque villages of Brittany,



TOURIST ROUTES FROM ENGLAND TO BORDEAUX AND SPAIN.

and crossing back from St. Malo to Southampton is an unforgettable experience. Yet the ordinary return fare, for these 1,215 miles is only £5 6s. 8d.

As a comparison it may be mentioned that the ordinary third class return fare, London and Aberdeen (1,046 miles) is £6 17s. 10d.

On June 1, the London and South Western Railway Company restored their summer steamer service between Southampton and Cherbourg (the gateway to Western Normandy). This service, with rail connections from and to London, operates thrice weekly — on Mondays, Wednesdays and Fridays outward, Waterloo dep. 9.30 p.m., Southampton sail at midnight. Returning on Tuesdays, Thursdays and Saturdays, from Cherbourg at 11 p.m., due Southampton 6.30 a.m. and Waterloo 9.15 a.m. The steamer employed is the *Ardena* (1,092 tons), and the open sea passage is only five hours.

Between Southampton and St. Malo (for Brittany) are regular sailings by the ss. *Lorina* (1,504 tons), and *Princess Ena* (1,203 tons). These sailings, which are dependent upon the tides at St. Malo, run every weekday during most of the summer season (July to September), and convenient connecting express trains run between Waterloo and Southampton in each direction.

The ordinary return fares (third rail and second-class boat) are :

	Single. s. d.	Return. s. d.
Waterloo and Cherbourg .. (161½ miles)	37 10	58 2
Waterloo and St. Malo .. (229½ miles)	42 9½	67 2½

Holders of return tickets between England and Cherbourg or St. Malo (and, it may be

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added, Havre), can come back from either of these ports without extra charge, provided they pay their French railway fare between the ports.

During the summer, excursion tickets are issued on certain days to Cherbourg and St. Malo from London, Southampton and certain other South Western stations.

So far, this season, the French State Railways have been unable to permit the London and South Western Railway to advertise through bookings from London to Bordeaux, &c., by these routes, but tickets may be bought to the French ports, and there local tickets booked to the places desired. This plan is really quite convenient.

Commencing June 1, at the request of the London and South Western Railway, through coaches have been placed on certain trains running from Cherbourg and St. Malo to Bordeaux, connecting at this town with direct services to that delightful chain of resorts nestling under the shadow of the Pyrenees, and to many other interesting towns like Dax, Bayonne, Biarritz, Toulouse, &c. as well as to the Spanish frontier and interior.

The stock on these through trains is quite modern, and provides very comfortable travel. Up to the present no restaurant-cars have been included, but excellent buffets are provided at all the large stations and junctions, and meals can be conveniently taken during the stops arranged for in the timings of the services.

From Cherbourg to Bordeaux two routes are offered—one via Caen, Mezidon, Le Mans, Chateau-du-Loir, Thouars, Niort, and Saintes, and the other via Coutances, Dol, Rennes, Nantes and La Rochelle.

By the first service—running daily—a passenger leaves Cherbourg at 4.30 p.m. and reaches Bordeaux at 9.55 a.m. next day. The distance is 763 kilometres (approximately 464 miles) and the single fares (in francs) are :—

CHERBOURG—THE GATEWAY TO WESTERN NORMANDY.
View of the Town and Docks, showing the Railway Station on the left.

	Fr.	c.
First class	161	15
Second class	106	20
Third class	67	55

(plus stamp duty, which is for fares between 10 and 100 fr.: 25 c., and above 100 fr.: 50 c.—really quite a minute addition). At the rate of 50 fr. to £1, these fares are equivalent in English currency to :—

	£	s.	d.
First class	3	4	6
Second class	2	2	6
Third class	1	7	6

By the second route—the service which runs on Tuesdays, Thursdays and Saturdays only, in connection with the steamer

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from Southampton–Cherbourg dep. 11.55 a.m., Bordeaux arrive 6.43 a.m. next day—the fares are :—

	Fr.	c.
First class	155	50
Second class	102	50
Third class	65	20
equal to		
	£	s. d.
First class	3	2 0
Second class	2	1 0
Third class	1	6 0

From St. Malo there is a daily service at 5.17 p.m. arrive Bordeaux 6.43 a.m. next day, via Dol, Rennes, Nantes, and La Rochelle. Corresponding return services also run.

The map shown on page 192 illustrates these routes and a tourist can spend a very delightful week or two in journeying, in leisurely fashion, outward (say) via Cherbourg and homeward via St. Malo, breaking his journey at any town of particular interest *en route*.

A very convenient itinerary is as follows :—

Outward—

Mondays, Wednesdays and Fridays—

Waterloo	dep.	9.30 p.m.
Southampton	dep.	midnight.
(*sleep on board*)		
Cherbourg	arr.	6 a.m.
		(*next day.*)
,, ...	dep.	4.30 p.m.
Caen	arr.	6.45 p.m.
(*sleep at Caen*)		
Caen	dep.	8.26 a.m.
		(*next day.*)
Mezidon	arr.	8.46 a.m.
,, ...	dep.	9.5 a.m.
Le Mans	arr.	11.30 a.m.
	dep.	11.52 a.m.
Angers (M.E.)	arr.	1.9 p.m.
	dep.	1.21 p.m.
Thouars	arr.	2.49 p.m.
	dep.	3.17 p.m.
Bordeaux	arr.	8.52 p.m.

These timings permit the passenger to make the rail journey in daylight, and the route lies through really wonderful country.

ST. MALO—THE PORT FOR BRITTANY.
Steamship "Princess Ena" at Quai.

Cherbourg is one of the most important military and commercial ports of France. It offers good bathing facilities and there is a good casino. As the tourist arrives early in the morning from Southampton and does not leave till 4.30 p.m. in the afternoon he has ample time to visit the town and neighbourhood. An excursion by the light railway to Barfleur is recommended. The railway station at Cherbourg lies about ten minutes' walk from the quay where the Southampton boat arrives.

The route chosen lies through Valognes (a sleepy old town rich in Roman remains, and possessing a fine 14th century church), Lison (railway junction for St. Lo, Brest, Coutances and Vire), Bayeux (famous for its grand cathedral, visible from the passing

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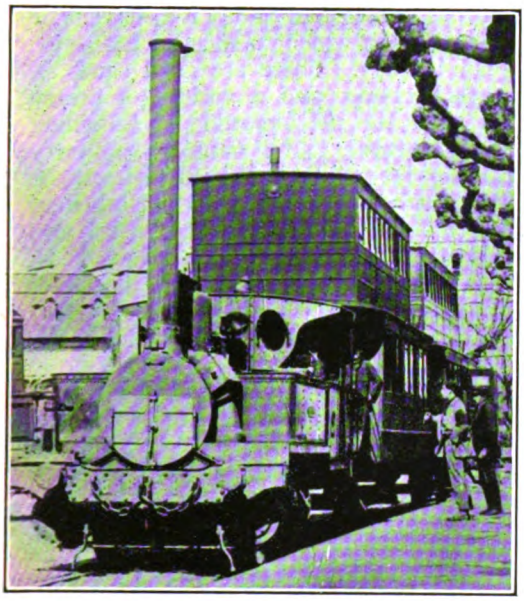
train), and Caen, where a rest for the night is suggested. Caen is one of the most curious towns in France, for while it has important commercial interests there still hangs over the old part of the town an atmosphere reminiscent of mediæval times. There is a canal running to the sea, and two lines of light railways, *Chemins de fer de Caen à la mer* and *Chemins de fer de Calvados*, serve coast resorts, the former running to Dives Cabourg and the latter to Courseulles.

The "railwayist" will be much interested in the stock and methods of working of these two companies, both of which have their terminus adjoining the State Railway station at Caen.



OLD LOCOMOTIVE AND TRAIN AT BIARRITZ.
This engine, built in 1870, hauls the train between Biarritz and Bayonne. The carriages are double-decked and second-class passengers go upstairs.

Proceeding the next day at 8.26 a.m., Mezidon is reached at 8.46 a.m. and a quarter of an hour's wait gives an opportunity to inspect this station which was one of the halts used in the through military service which ran between Cherbourg and Taranto (Italy) during the war to avoid submarine dangers in the Bay of Biscay and the Mediterranean.

The route from Mezidon lies through Argentan and Alençon (famous for its lace and 15th Century Gothic cathedral). Presently Le Mans (a town of Roman origin), on the main Paris–Nantes railway line, is reached, and the twenty minutes' wait will be welcome (a trip to the buffet will naturally suggest itself).

Angers is the next stop. This is an ancient city built in the form of an amphitheatre, with a massive castle and a graceful cathedral. Crossing the River Maine, the wonderful wine-producing country is entered, and the line passes through miles of glorious vineyards. A half-hour's halt is made at Thouars, and the road then lies through Niort, Rochefort, Saintes, Pons (junction for Cognac, of world-wide fame), and the great locomotive hauling the very heavy train enters the St. Jean station at Bordeaux. There are four stations here, and the Gare St. Jean is the principal. The others are Gare d'Orleans, Gare du Medoc, and the Gare de l'Etat.

The fourth largest town in France, Bordeaux is situated on the banks of the river Garonne, 60 miles from the sea. During the war it was a great American Army base, and the numerous buildings erected along the river banks are a monument to our Allies' industry and skill. Especially notable, from a railway point of view, are the miles upon miles of railway sidings which were constructed for military purposes, but which are now of real value to the commerce of the district.

The railwayman will find much to enthuse about here. For example, the special arrangements for handling the enormous wine traffic (this might easily form the subject of a most interesting special article), the trains departing for and arriving from Paris or Spain, and the great international expresses running right across France to Italy, via Montluçon, Lyons-Perrache, and Modane—and the heavy local traffic, both passenger and goods.

For one who can spare the time, numerous excursions may be made in the neighbourhood. Some of the more famous vineyards (the names of which appear in every restaurant wine-list) are well worth visiting, and a journey on to the Spanish frontier is an easy matter. The line passes through the famous Landes country (where shepherds walk on stilts), and at Bayonne, the journey might be broken to

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see the quaint double-decked stock working on the branch line to Biarritz. This train is hauled by a locomotive built in 1870, and is believed to be the oldest engine in active use. An illustration appears on the previous page.

For the return journey from Bordeaux to England, the following time-table is suggested :—

Homeward—

Bordeaux (St. Jean) ..	dep.	8.10 a.m.
Saintes	dep.	10.5 a.m.
Rochefort	dep.	10.48 a.m.
La Rochelle	dep.	11.41 a.m.
La Roche-sur-Yon ..	dep.	1.46 p.m.
Nantes	dep.	3.30 p.m.
Rennes	dep.	6.13 p.m.
Dol	dep.	7.15 p.m.
St. Malo	arr.	7.37 p.m.

Here again the journey is made in daylight, permitting splendid views of the glorious scenery of Lower Brittany, and, so far as Rochefort, the line is that traversed on the outward journey. Thereafter it passes through La Rochelle (which has had a chequered history, and on several occasions, notably from 1360 to 1372, was under English domination. It is a most interesting town, with many old buildings, a 15th Century cathedral, a fine beach and a casino). La Roche-sur-Yon (the junction for Les Sables d'Olonne, a charming watering place with miles of golden sands), Nantes (where, if desired a day may be well spent in visiting the Cathedral, Museums, and the 14th Century. Chateau with moat, and to make the pleasant excursion down the river Loire to St. Nazaire).

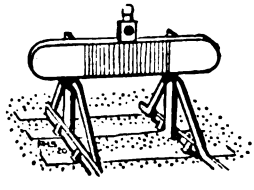
Continuing the journey, when convenient, the train passes through Rennes (which has a fine Cathedral, and is a good centre for visiting some of the out-of-way Breton villages, with their curious houses and customs), and runs on to Dol, the junction for St. Malo.

It may be here noted that a through service also runs on certain days to Cherbourg (Bordeaux dep. 10.1 p.m.) over the route just described, and after passing Dol and Pontorson (whence a steam tramway runs to Mont St. Michel—one of the "wonders of the world") runs via Avranches, Coutances, and Valognes, reaching Cherbourg at 3.28 p.m. the following day and connecting with the steamer to Southampton.

St. Malo was one of the old pirate strongholds of France, and to-day is a convenient little town in which to spend a few days' quiet holiday. There are good sands, a modern casino, and a variety of pretty places in the neighbourhood. Adjoining are St. Servan and Paramé—two pretty beaches favoured by British visitors. A little further along the coast is Rotheneuf (noted for its curious carved rocks) and Cancale, with its famous oyster-beds, while across the blue waters of the River Rance lies Dinard, the "Nice of the North," and half-a-dozen other beautiful little resorts.

The scenery is superb and the tourist (who can spare the time) would be well advised to linger a while on the "Emerald Coast" before he takes the South Western Railway Company's luxurious turbine steamer homeward-bound.

Then a restful night's sleep, in one of the spotlessly clean, white cabins, an awakening as the steamer glides up Southampton Water, a good English breakfast on the non-stop boat train, and a punctual arrival at Waterloo station will cause him to feel that his holiday, with its twelve-hundred miles of comfortable sea and rail travel, has indeed been a wonderful and unique experience.



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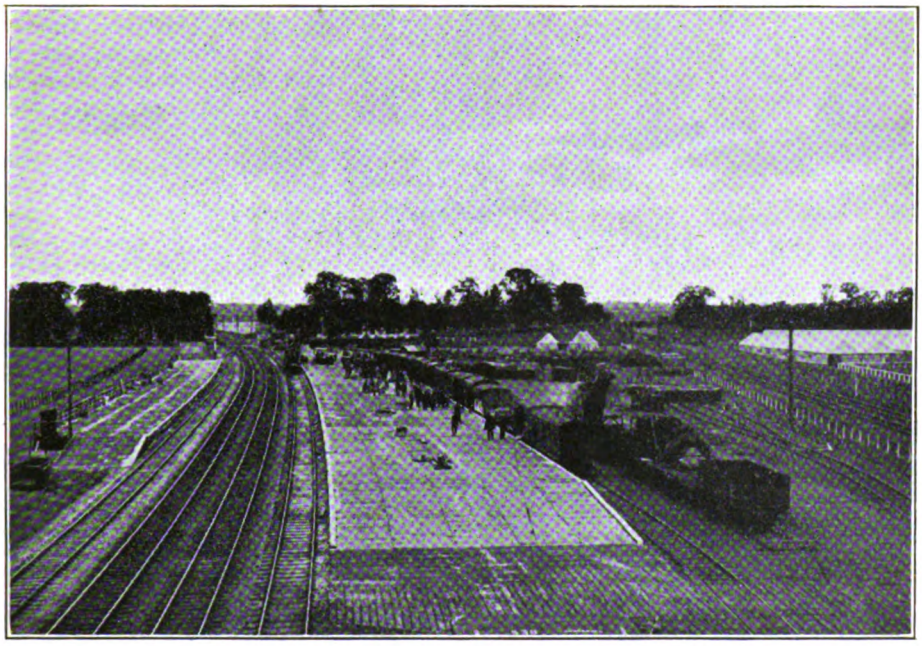
Great Eastern Railway and the Royal Agricultural Show at Cambridge.

TRAFFIC working in connection with a Royal Agricultural Show is always a heavy undertaking for the railway or railways serving the site at any time, especially when, as in the case at Cambridge this year, a temporary station has to be built on new ground, and materials, implements and plant, live stock and passenger traffics have to be dealt with on a very large scale, not only during the Show itself, but also for some time before and after the period of public admission.

The Show ground was located near the Trumpington Long Road level crossing, about half-a-mile on the London side of Cambridge station, and on the west of the London and North Western line. The special station was placed in the angle between this and the Great Eastern main line, the Great Eastern being responsible for all traffic working, including that brought by the London and North Western Railway and handed over at the Cambridge passenger and goods stations.

On the up side an existing shunting spur from Hills Road Junction (where the London and North Western lines make connection) was extended as an up reception road to Trumpington signal cabin, and given a platform built up of sleepers, 500 ft. in length and 27 ft. in width. At the Trumpington end a roadway led direct to Trumpington Long Road. On the down side the existing down reception road, commencing at the Trumpington level crossing, served one face of another temporary platform, 500 ft. long and 45 ft. in width, an additional siding being laid in to serve the outer face of this platform, thus providing two lines on which trains could be loaded or unloaded. There was also a second siding, alongside a roadway enabling railway wagons to be unloaded or



GENERAL VIEW OF THE SPECIAL STATION BUILT FOR THE HANDLING OF SHOW TRAFFIC.

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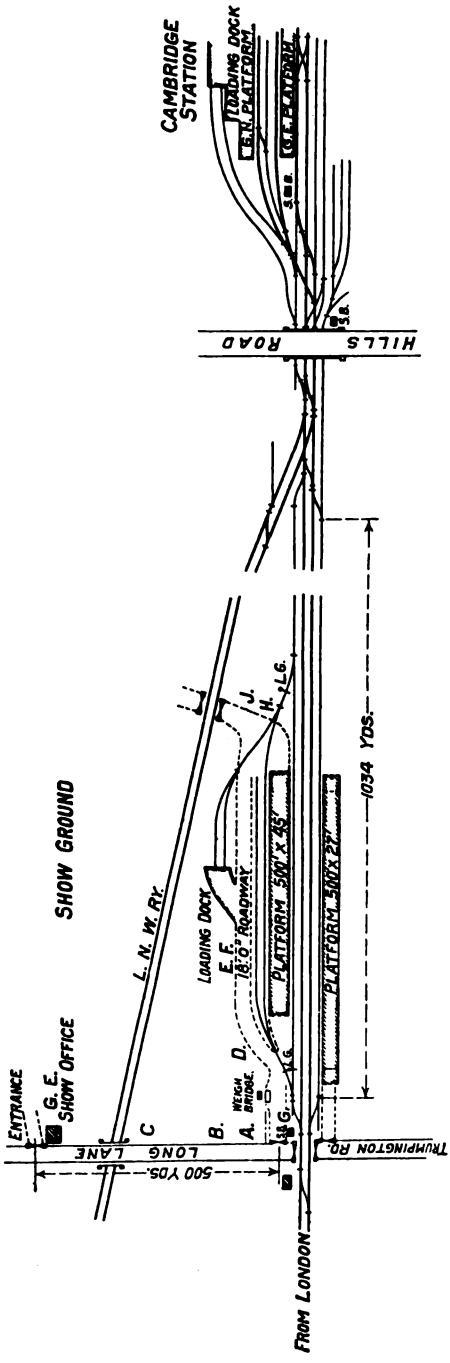
loaded directly from or to road floats or drays. The outer and inner faces of this island platform were known as Platforms A and B, respectively, that on the up side being referred to as C. At the Cambridge end platform line A rejoined the down reception line, and also gave access to two spur sidings serving an end-on loading bank reached from the roadway already mentioned. At this end a road was made crossing these lines and passing over the London and North Western lines through a protected occupation crossing, providing a route for heavy machinery and live-stock to pass directly into the Show grounds. The usual route, however, for plant, exhibits, live-stock and passengers was via the roadway on the down side, passing a 20-ton weighbridge, policeman's hut, staff time-office, &c., to Trumpington Long Road, and thence by a bridge crossing the London and North Western Railway lines to the "Second" Show entrance immediately beyond. The up and down reception lines were properly signalled, and several additions and alterations were made in the points and connections, including a new cross-over between the up and down main lines on the Shelford side of Trumpington signal cabin. The points in the sidings were hand-worked and controlled by Hodgson's patent hand bolt locks. The key therefor was in the custody of a groundsman in charge of working at the Trumpington end of the station. At the Cambridge end a fixed "danger" signal was provided, and trains were only allowed to pass under instructions of a responsible official there, who was in telephonic communication with the outlet end, near Hills Road Junction, from the down reception line. Provision was made for wrong line working as necessary, and to meet the various conditions which might arise, including the use of pilotmen to safeguard certain movements, in conjunction with the signalman at the Trumpington cabin.



A. Hutment for Commercial and Telegraph Staff. B. Hutment for Operating Staff, C.M.E. and Police. C. Marquee for Staff Mess accommodation. D. Hutment for Commercial and Operating Inspectors working together. E. Carriage Body as Shelter for Clerical Staff. F. Carriage Body as Shelter for Uniform Staff. G. Pointman's Hut, Level Crossing end of Station. H. Pointman's Hut, Cambridge end of Station. J. Staff Urinals and W.Cs.

PLAN OF TEMPORARY STATION FOR ROYAL AGRICULTURAL SHOW TRAFFIC, ERECTED BY THE GREAT EASTERN RAILWAY AT TRUMPINGTON LONG ROAD, CAMBRIDGE.

Adjacent to the down side access to the

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station several huts were erected, one to accommodate the commercial department station staff, and including a telephone exchange connecting the various premises and communicating also with the divisional operating and divisional commercial offices at Cambridge station, and thence with the general telephone system, including a direct line to headquarters in London. Another hut accommodated the operating staff, with a separate section for the Chief Mechanical Engineer's department, where an official was stationed responsible for arranging or re-arranging the duties of a service of motor omnibuses was operated during the Show period, but passengers arriving at the Show station entered by the "Second" entrance, previously mentioned, adjacent to the bridge over the London and North Western Railway, this also receiving most of the plant, exhibits and live-stock arriving by rail. Near this "Second" entrance was a range of railway offices comprising accommodation for directors and chief officers of the railway company, a general inquiry and canvassing office, a live-stock booking office, and a small private office for the use of the chief

PASSENGERS DETRAINING TO VISIT THE SHOW.

enginemen of trains coming to the Show, and for the railway police. A further hut was provided for the use of commercial and operating inspectors working together, while two old carriage bodies were used as shelters, respectively, for the clerical and uniform staff. There were also huts for men in charge of traffic working at each end of the station, and other necessary equipment.

The chief entrance to the Show ground was on the Trumpington Road. This was most convenient for passengers coming from Cambridge station, for whose benefit canvassers. Close by the main entrance there were also several other railway offices, where the Great Eastern Railway had an inquiry staff, with a private room for use by the railway canvassers. Near the centre of the ground an artistic kiosk was erected, where also railway inquiries were dealt with, mainly on the passenger side in reference to train facilities, &c. Adjacent to the "Second" entrance was a receiving yard, while alongside the main entrance was an empties yard, to which all empty cases, &c., were sent in order to facilitate distribution as required at the

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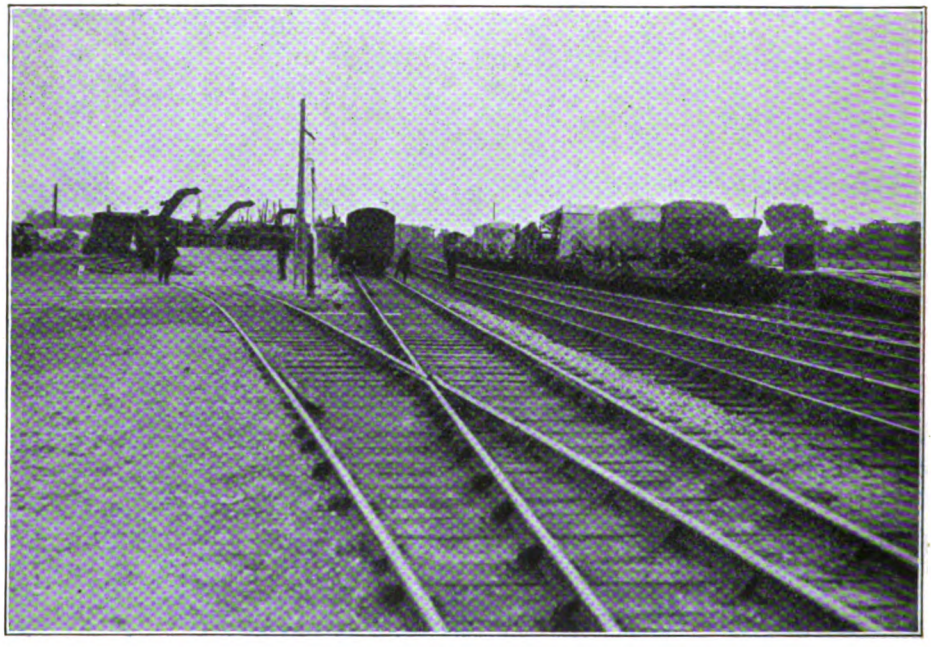
close of the Show. The Great Eastern Railway Company had a foreman in charge of the latter, while they also provided a traction engine fitted with a crane having a capacity of 8 tons at 11 ft. radius, which could be hired by any exhibitor for loading or unloading exhibits and plant.

In view of the large numbers of men who had to be drafted to Cambridge, and of the difficulties of providing accommodation during the busiest period in the town, several trains of ordinary passenger carriages, and a few sleeping cars borrowed from other companies, were placed in the



UNLOADING AGRICULTURAL IMPLEMENTS, &c., AT THE ROYAL SHOW STATION.

Tenison Road sidings and in the Great Northern Railway sidings near Cambridge station. All compartments were numbered, and those in ordinary vehicles equipped for sleeping purposes. The provision of meals for men engaged at the Show station and in the Show also called for special arrangements. During the busiest period all staff worked on 12-hour shifts, and during this time meals were provided in a large marquee erected near the Show station.

Construction of the new station, permanent-way alterations, &c., were carried out by the Chief Engineer's Department, under Mr. J. Miller, B.Eng., and signalling by Mr. W. H. Bird, Signal Superintendent. On the operating side, Lieut.-Colonel H. H. Mauldin, Superintendent of Operation, was represented by Mr. H. J. Prytherch, M.B.E., Chief Assistant, working in conjunction with the Divisional Superintendent of Operation, Mr. J. Rogers. On the commercial side, Mr. T. W. Watts, Commercial Superintendent, was represented on the spot by his Chief Outdoor Assistant, Mr. R. A. Newman, in conjunction with the Cambridge Divisional Commercial Superintendent, Mr. E. Robinson. Working of the Show station was placed under the charge of Mr. C. G. Osman, Goods Agent at Spitalfields, temporarily transferred to Cambridge.

To facilitate the working of trains temporary block telegraph signal-boxes were provided, one about midway between Shepreth Branch Junction and Trumpington and another about midway between Chesterton Junction and Waterbeach station. Fixed signals were not provided at these boxes but men were stationed there with hand and detonating signals, detonators being placed on each line until the signalman gave instructions for them

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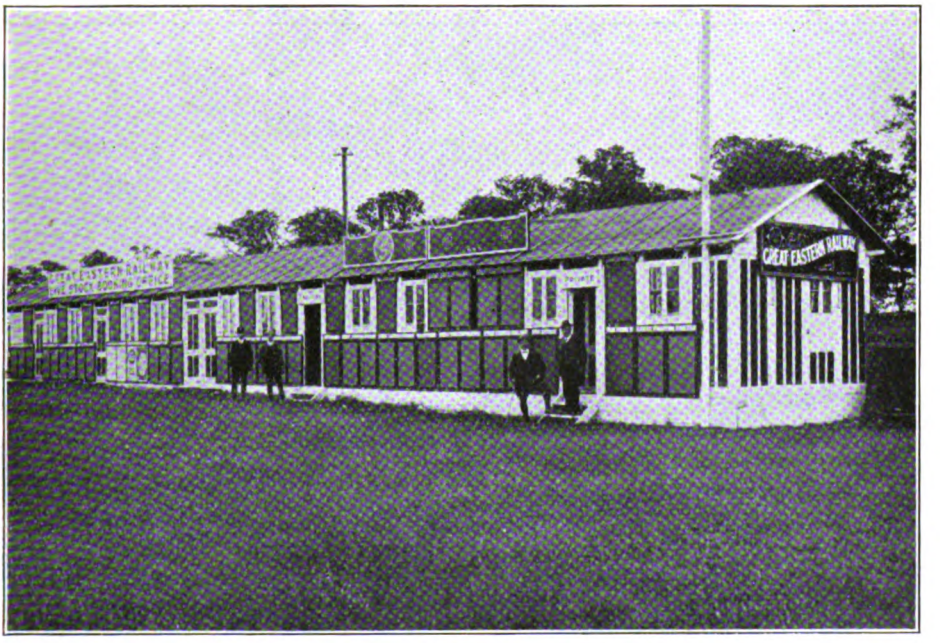
to be removed and permission to give trainmen a green flag or green light signal. All trains approaching Cambridge were required to proceed with special care and to be prepared for hand or detonating signals at these temporary cabins, when passing the Show station or elsewhere. A special code of bell signals was also in force between Whittlesford station, Shepreth Branch Junction and Shelford. In connection with the working of special trains general instructions were issued that certain lines or branches might have to be kept open beyond the ordinary times for the running of special trains, and that signal-boxes might have to be switched in at times when they would ordinarily not be in use.

In view of the limited storage accommodation in the immediate vicinity the empty vehicles of live-stock trains were, as a rule, worked away to Park, Whittlesea, or Crown Point (Norwich), a number received from the London and North Western Railway Company being returned to that line for storage. A difficult part of the work was that of arranging the duties of guards and enginemen and for relief. In order to avoid congestion a number of alterations in ordinary goods train working, and occasionally in regard to passenger trains, had to be made, involving, in some instances, the special routing of goods trains to reach the Colchester main line, whereas ordinarily they would pass through Cambridge.

There is no need to go into detail as regards the methods for dealing with the traffic on the commercial side, except to mention that on the arrival of live stock, the stockman in charge of each group of animals was given a card indicating the date, time and place when he must book for the return specials. There were two of these cards, one white and one red, the former intimating that the return journey must be booked between 9 a.m. and 6 p.m. on Wednesday, July 5, and the latter similarly specifying Thursday, July 6. In practice, these were alternated, so that the work of booking was distributed more equably than would have been the case had, for example, the trains arriving on one day been all given the same booking day. Another special feature was the use of "Marshalling Lists" for dealing with live stock, these constituting the basis upon which the operating staff worked in arranging the return live-stock specials.



G.E.R. HEADQUARTERS AT THE ROYAL AGRICULTURAL SHOW, CAMBRIDGE.

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Horses, carriages, poultry, rabbits, goats and horticultural vans arriving by ordinary passenger trains were dealt with at the Cambridge passenger station and accounted for by that station in the usual way, except that, where required, particulars were obtained upon arrival as to the date and time of departure and vehicles required. Traffic from and to the London and North Western Railway, as also that of the Great Northern and Midland Companies, was worked to and from Cambridge station and transferred by the Great Eastern Railway to and from the Show station.

A special booklet was issued by the Great Eastern Railway Company combining in alphabetical tables the entire train facilities to and from Cambridge throughout the Show period, including

CATTLE BEING LOADED INTO ROAD VEHICLES FOR TRANSFER TO THE SHOW.

During the days immediately preceding the Show many trains serving Cambridge were given reliefs, and throughout the actual Show period a liberal train service was provided on all routes converging upon Cambridge. In regard to the London-Cambridge traffic the principal additions calling for comment were the 8.37 a.m. restaurant car express from Liverpool Street behind the ordinary 8.30 a.m. train, due at the Royal Show station at 10.5 a.m., and the 9.50 a.m. relief to the 10.5 a.m. These ran on each day except Monday and Saturday. On Monday there were trains at 11.40 a.m., 2.39, 4.50 and 5.49 p.m. respectively, relieving the 11.50 a.m., 2.34, 4.45 and 5.49 p.m. trains. The 8.37 and 9.50 a.m. additional trains called at the Royal Show station, the ordinary trains using Cambridge main station, as usual. On Saturday, July 8, reliefs were provided to the 11.50 a.m. and 2.34 p.m. trains from Liverpool Street. In the opposite direction corresponding additions were made.

excursions from all directions and from other railways in connection. On Tuesday, Wednesday, Thursday, Friday and Saturday, July 4, 5, 6, 7 and 8, respectively, day return tickets at single fares were issued from stations within a radius of 60 miles, and at single fare and a third from stations more distant, available on July 4, 7 and 8 by any train arriving at Cambridge not later than 4.30 p.m., and on July 5 and 6 by any train. Special day excursions were also run from certain stations to Cambridge on July 5, 6, 7 and 8. On Wednesday and Thursday, July 5 and 6, there were illuminated fêtes in the grounds of

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Trinity and St. John's Colleges, including a river pageant, water sports, flower show, &c., and special trains were run between 10.50 and 11.20 p.m. for stations within 20 miles or so of Cambridge in all directions. There were also late trains on various routes on the Friday and Saturday between 8.30 and 10.10 p.m. where the ordinary services terminated earlier.

Besides the Great Eastern Railway trains there were, of course, additional and excursion trains worked by the London and North Western, Midland and Great Northern Railway Companies, in several instances from relatively distant places, while other railways arranged through services to Cambridge, handing over their trains to the Great Eastern Railway as convenient. For example, the Great Central Railway provided a day excursion train from Manchester, &c., to Cambridge, on which a dining car was run, the train being handed over to the Great Eastern Railway at Lincoln.

The live-stock traffic involved, as is usually the case at a Royal Show, complicated special arrangements, the trains having not only to be worked from all directions, but requiring to be scheduled so that they could be conveniently dealt with at Trumpington, allowing sufficient intervals between arrivals for unloading live-stock, cleaning vehicles, &c., and calling also for elaborate arrangements for storage of trains and preparation for the return journeys, which did not necessarily correspond with those to the Show. This traffic, moreover, was necessarily concentrated within the day or two preceding the opening of the Show, while distribution afterwards similarly called for prompt working.

On Saturday, July 1, 25 live-stock specials were scheduled to arrive at Trumpington between 2.45 a.m. and midnight. These came from centres on the Great Northern, Great Western, London and North Western, Midland, Great Central, London and South Western, and London, Brighton and South Coast Railways. On Sunday, July 2, 22 trains were booked in between 1.10 a.m. and 5.30 p.m., including trains from the South Eastern and Chatham, North Eastern and North British Railways, in addition to systems already mentioned. On Monday, July 3, 17 specials were booked in between 6.45 a.m. and 5.25 p.m., making a total of 64

UNLOADING HORSES FOR THE SHOW.

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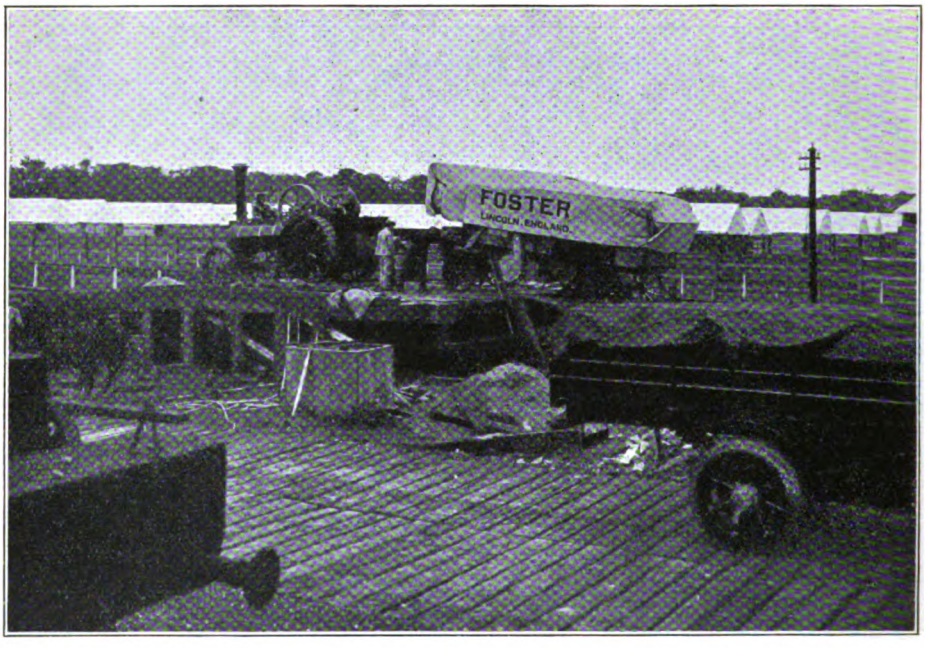
trains. Those from the London and North Western and Great Northern Railways were usually worked by engines belonging to those companies and handed over to the Great Eastern Railway at Cambridge station, if not run directly to the Show dock platforms. Two Midland trains were worked through from Huntingdon by Midland engines and men. Midland and Great Northern trains handed over at Peterborough were worked to Cambridge by Great Eastern engines and men. The Great Western, Great Central, North Eastern, North British, London and South Western, London, Brighton and South Coast and South Eastern and Chatham trains were routed via the Great Eastern Railway, approaching Cambridge either from the north or south. Those from the London, Brighton and South Coast and South Eastern and Chatham Railways came via the East London Railway and Liverpool Street. The empties of all these specials were booked to run on to Whittlesea, Park, Crown Point (Norwich), or handed over to the London and North Western Railway for stowage, a few being stowed in the actual vicinity of Cambridge.

During the days preceding the show, 1,233 railway wagons of all types, many conveying traction engines, agricultural machinery, implements, &c., were received. Of these, 407 were unloaded by crane power, 700 by hand labour and 126 by means of the end-on docks. Cartage to the ground required 1,564 loads, representing 1,732 tons carted or trailed by Great Eastern Railway teams, 551 tons being transferred by consignees or their agents. As the distance was short and this work was fairly well distributed, 19 horses sufficed, a number of floats and drays being loaded up simultaneously, ready for the horses as they became available.



UNLOADING AGRICULTURAL MACHINERY AT END-ON DOCK.

During the live-stock period, about 40 hours of continuous high pressure, from Saturday evening, July 1, to Monday morning, July 3, the 64 special trains, and miscellaneous vehicles equal to another train, involved 1,195 vehicles, necessitating 537 dray loads and 330 float loads for transferring live-stock which could not be or was not walked to the Show ground, requiring the use of 103 horses. This work was conducted very efficiently, the average time for examining, collecting particulars, unloading, cleaning and closing up working

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out to an average of barely 40 min. per train averaging 20 vehicles, including unloading fodder, baggage, &c., travelling with the animals. Not a single casualty of any kind occurred, however, despite the fact that much of the work was done on a dark night, pouring incessantly with rain, and entailing great discomfort to the staff employed.

At the conclusion of this work, Sir Gilbert Greenall, Bart. C.V.O., Honorary Director of the Royal Agricultural Society, and Mr. T. B. Turner, Secretary, personally congratulated the officials of the Great Eastern Railway Company in regard to the efficiency with which the work had been done.

The return live-stock traffic on Saturday, Sunday and Monday, July 8, 9 and 10 entailed a total of 62 booked special trains and 4 or 5 miscellaneous train-loads of a clearing-up character. The great difficulty was that a considerable percentage of the live-stock had been sold and therefore involved destinations different from the places of origin. Frequently, too, animals were consigned in ones or twos. In fact, all the commercial and operating staff who had to work out the details of these trains were kept very busy on Wednesday and Thursday, July 5 and 6, and throughout Thursday night, and the entire programme was therefore available on the Friday. It must be remembered, too, that most of the empty vehicles came from the marshalling grounds at Crown Point (Norwich), Whittlesea and Park, and these had to be, to some extent, re-marshalled in time for the booked departure from the marshalling point.

The first special was booked to leave at 8 p.m. on Saturday, but actually left about 7.30 p.m. Seven other trains were booked out before midnight; 40 others were dealt with between Saturday midnight and Sunday midnight, and 14 others by Monday morning, the last being booked away at 9.30 a.m. On the average, these trains left 40 min. before time. Of these 62 trains, 9 were handed over to the London and North Western Railway; 1 to the Great Northern Railway via Hitchin; 2 to the Great Northern Railway via Peterborough; 1 to the Great Northern and Great Central Railways via Lincoln; 1 for Great Eastern, Great Northern and Great Central traffic via Spalding; 4 to the North Eastern Railway via Doncaster; 3 to the

UNLOADING LIVE-STOCK AND STORES FOR THE SHOW.

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Midland Railway via Peterborough ; 2 to the Midland Railway via Huntingdon ; 9 to the Great Western Railway via the London and North Western route, and 2 via the Great Eastern Railway, Victoria Park and Acton ; 3 to the London and South Western Railway via the Great Eastern Railway, Victoria Park and Gunnersbury ; 5 to the South Eastern and Chatham Railway via the Great Eastern Railway, East London Railway and Hither Green ; and 4 to the London, Brighton and South Coast Railway via the Great Eastern Railway, East London Railway and New Cross. Those via the London and North Western Railway, and those to the Midland Railway via Huntingdon were operated from Cambridge station by engines and staff of those companies, the remainder being worked by Great Eastern engines and staff to the respective frontier points. The Great Eastern specials involved destinations in all directions radiating from Cambridge.

A special feature conducing to the highly successful results achieved was undoubtedly the arrangements made for controlling the passage of live-stock from the Royal Show ground to the station. Fortunately, weather conditions were rather more favourable (though still somewhat unsatisfactory) than they had been during part of the unloading period. During the live-stock period a certain amount of implement and general traffic was also worked away, a number of exhibits requiring immediate transfer to the Agricultural Show at Peterborough.

Seeing that the weather was generally of a more or less unfavourable character, it is not surprising that the total numbers of passengers dealt with at Cambridge main station and at the Trumpington Show station were below those realised at many previous Shows of the Royal Agricultural Society. The trains were, however, on the whole, well filled. The traffic dealt with by the Great Eastern Railway included the following special passsenger trains at the Royal Show station : July 4, 2 ; July 5, 12 ; July 6, 11 ; July 7, 21 ; July, 8, 8. Including passengers at Cambridge main station, the daily totals were as follows : July 4, 3,323 ; July 5, 12,065 ; July 6, 13,947 ; July 7, 7,982 ; July 8, 7,233.

Previous to the opening of the Show, a meeting was called by the Commercial Superintendent, Mr. T. W. Watts, attended by all grades concerned. Mr. R. A. Newman, Chief Outdoor Assistant, explained the methods to be adopted, and Mr. Watts and Lt.-Col. Mauldin followed by a few words asking for full co-operation, and that all should endeavour to uphold the best traditions of the Great Eastern Railway Company. This request was fully responded to, and we are asked to record that " too much credit cannot be attached to the splendid team work put in by everyone," including those out on the line and elsewhere on the system who had to deal with the marshalling and working of the traffic, often of a complicated and generally of a heavy and difficult character. In some respects, work at Trumpington was facilitated by the fact that trains could be received and despatched in both directions without reversing and without interference, the station being a " through " one, but the large numbers of entries, particularly in the cattle and pig sections, entailed an abnormal amount of cartage. All machinery and implement traffic was delivered by 6.30 p.m. on Friday, June 30, and all live-stock by 6.30 p.m. on Monday, July 3.

A special point was made that catering for the staff should be of the best quality and ample in quantity. No intoxicants were served, but tea and coffee could be had as often as desired without tickets, and the meals were substantial and good, supplied under the direction of the company's Hotel and Refreshment Rooms Department.

For facilities for visiting Trumpington and for information upon which this article is based, we are indebted to Sir Henry Thornton, K.B.E., General Manager ; Mr. S. A. Parnwell, Assistant General Manager ; Lt.-Col. H. H. Mauldin, Superintendent of Operation ; Mr. T. W. Watts, Commercial Superintendent ; Mr. J. Miller, Chief Civil Engineer, ; Mr. H. J. Prytherch, Chief Assistant to Superintendent of Operation ; Mr. R. A. Newman, Chief Outdoor Assistant to the Commercial Superintendent ; Mr. J. E. Sharpe, Chief Clerk to the Superintendent of Operation ; Mr. U. Sharpe, in charge of the time-table section ; Mr. J. Rogers, Cambridge Divisional Superintendent of Operation ; Mr. E. Robinson, Cambridge Divisional Commercial Superintendent and others.

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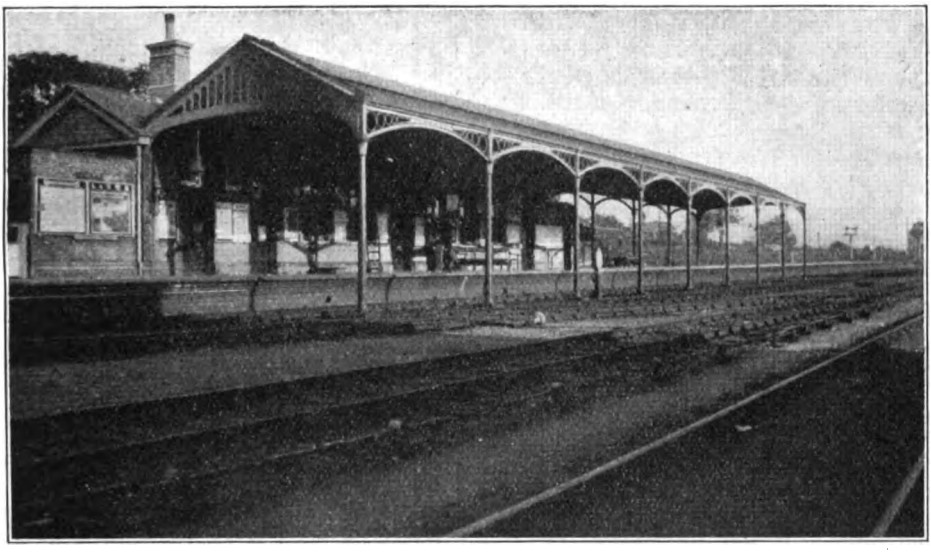

Photo.] [*W. Chandler.*

ST. ALBANS STATION, LONDON AND NORTH WESTERN RAILWAY.
Looking towards Junction with Great Northern Railway.

The St. Albans Branch of the London and North Western Railway.

By W. E. EDWARDS.

UNTIL May, 1858, the town of St. Albans (not, as yet, having attained to the rank of a Cathedral City) was unprovided with railway facilities, although communication was, more or less, established with the Great Northern Railway by an omnibus service to and from Hatfield, run in that company's interest.

It may therefore be readily conjectured that the opening of the London and North Western branch was celebrated with the *éclat* then customary upon such occasions, so we learn that on Wednesday, May 5, 1858, the festivity was inaugurated at 1 p.m. by a procession from the Town Hall, "headed by 30 navvies in white smocks, wearing bunches of pink and white ribbons upon their caps," accompanied by "the St. Albans Original" Brass Band, in caps of crimson and gold, with massive gold tassels, followed by Mr. Hade's Banner of Trade, a basket of plaited palm with fancy trimming, the produce of a loom; wreaths of flowers, and miniature hats of palms and straw plait. Next came Vyse and Sons' Royal banner, with the "Princess Royal Bonnet," and the "Prince of Prussia Hat." Then a bonnet of chaste white leghorn, henceforth to be known by the trade name of "The St. Albans Railway Opening." Another production consisted of a hat of horsehair braid, trimmed with fine plait, to be similarly styled as "the St. Albans First Class Carriage." The reader may gather from the foregoing that the process of straw plaiting at this period formed the staple industry of the town.

A further banner of trade was emblazoned with the motto "The Railway and Commercial Progress," on behalf of Mr. Harris. Then followed the Beadle, holding the Staff of Office, officers of the Borough police, the Mayor, George Debenham, Esq., in robes; Aldermen and Town Councillors; also the gentlemen and traders, marching four abreast. The Town brass band likewise attended,

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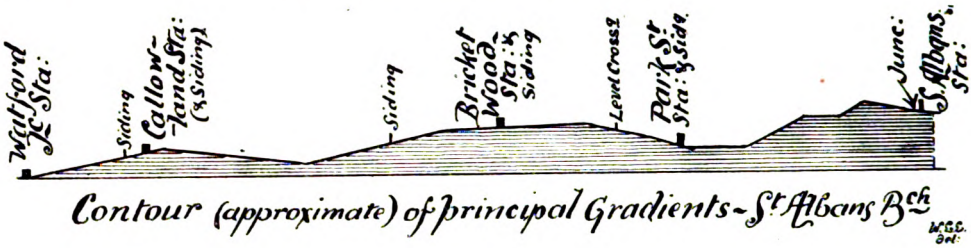

Contour (approximate) of principal Gradients - St. Albans Bch

arrayed in new caps of blue and gold. The procession passed through the Market Place and High Street, thence down Holywell Hill to the new station; 8,000 people are stated to have been present. A chronicler remarks that "the London and North Western Railway has built us one of the most chaste and symmetrical railway stations any line can boast of; in six up and down trains per day we possess almost equal advantages with a main line"

Next it is related that the expected train arrived "with the engine and tender decked in flags and evergreens," following upon which the Mayor of St Albans was introduced to Captain Creed, and the Hon. S. P. Vereker, of the London and North Western Railway directorate The visitors were forthwith invited to partake of a "cold collation," and, in apologizing for the absence of the accustomed viands, the Mayor remarked that "he could promise them a very warm reception" Amongst the toasts was that of the health of the Marquis of Chandos, the Chairman of the London and North Western Railway, as also that of the Directors, to which the above-mentioned Captain Creed replied. A musical programme followed, and amongst the humorous items rendered was the song known as "St. James and St. Giles," followed by another, which was highly popular for a very long period, entitled "Joe in the copper."

The original service of trains for the month of May, 1858, was the following:—

St. Albans.—Departures: 7.50, 9.5 12.55, 3.0, 5.15, 7.10. Arrivals: 8.40, 10.35, 2.0, 4.30, 6.0, 8.55. No Sunday service.

The single fares to London (24½ miles) were thus fixed:—First class, 3s. 6d.,

Photo.] [*W. Chandler.*

ST. ALBANS STATION, LONDON AND NORTH WESTERN RAILWAY.

From the junction signal cabin. Goods yard to left

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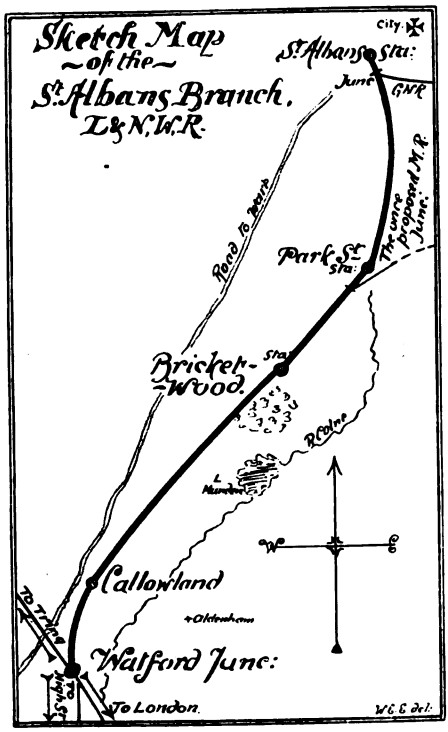

Second class 2s. 6d., Third class. 2s. od. Return, 4s. 6d., 3s. 6d.

The time-table in question contains the following announcement.

"At Bricket Wood, and Park Street, persons wishing to travel must be on the platform awaiting the arrival of the trains. The guard will issue tickets, and each person must have the exact amount of fare ready."

The omnibus service already mentioned between Hatfield and the Pea Hen Hotel, St. Albans, was maintained for some time, as heretofore, an appeal being issued by those responsible urging the public "not to forsake their old friends, the Great Northern Railway."

A notable feature characterises the St. Albans line in that it knows but little of cuttings, or embankments, hence the existence of several public level crossings thereupon. The gradients are also inconsiderable, the steepest being that of 1 in 179, beyond the 5 mile post, and rising in the St. Albans direction. The first mile outside Watford Junction (just beyond Callowland station) consists of an ascent of 1 in 380, followed by a fall of 1 in 621 for another mile. Next is a rise of 1 in 300, easing down to a lower gradient beyond Bricket Wood to a summit of 35 ft. above Watford. This is succeeded by a descent at 1 in 913 past Park Street station. Near the 5-mile post is a short level stretch, after which the summit point of the branch is reached near the sixth mile post, where the level is 50 ft. above Watford. A descent of 1 in 506 and 1 in 235 extends to the London end of the terminal station at St. Albans. A single-faced platform is there provided in which is a bay, frequently used by the shorter trains of the Great Northern Railway. The junction points with that line are controlled from St. Albans signal cabin, as well as the junction with the goods yard (containing half-a-dozen roads) together with the platform lines and the dock lines outside them. An outer home signal, governing the incoming London and North Western Railway trains, and fitted with an electrical "fireman's bell," is provided well outside the junction, aided by a "train waiting" indicator. The Great Northern Railway block instruments formerly existed at the junction box, applying of course, only to that company's trains; they are now, however, removed, under the "one engine in steam" single line staff system.

The six and a-half mile railway between Watford Junction, No. 3 cabin, or St. Albans' Junction box, and St. Albans, consists of single line, provided with a crossing station at Bricket Wood. Webb and Thompson *miniature* staff block instruments are employed throughout.

Callowland station, seventh-eighths of a mile beyond Watford, serves a comparatively recent industrial suburb of that town which, it is interesting to note, has increased to a population of over 40,000, although, at the time of the opening of the line to St. Albans, the total population was one of little over 10,000, its industry then being mainly agricultural. Callowland is a staff station, having a single platform face only. Bricket Wood, famous as a resort for school treats is, as stated, the crossing station, at which, of course, the electric staffs are exchanged. It is provided with a crossing loop and two platforms. Park Street has a single platform only. As indicated by the sketch map, the once contemplated junction with the Midland

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Railway would have been effected upon the Watford side of Park Street station. That company's objective was that of reaching Watford, but it is stated that the scheme fell through when it was decided by the London and North Western Railway to lay a single line only to that junction. An overbridge, built in anticipation of the connection noted, may still be observed upon the right, in journeying from Bricket Wood to St. Albans, the intended connection between the two lines taking an almost semi-circular sweep.

Various sidings exist upon the branch, those of an intermediate character being controlled by the electrical staff key In the downward direction, Tibbles' (cocoa) siding is first noticed, at a distance of three-quarters of a mile from Watford. At Callowland is situated Roffes' and Ayres' siding. That of Messrs. Taylor lies at the distance of 2⅝ miles from the same point, between Callowland and Bricket Wood stations. The latter is situate at 3⅜ miles from Watford. Park Street station, 4⅞ miles from the junction, has a siding also, facing in the down direction. A level crossing exists at Callowland, controlled from the signal cabin. Another is found at a distance of half-a-mile above Park Street station. The staff sections, as may be gathered already, are three in number, and the usual signalling arrangements exist at each of the stations.

A SCENE ON THE LYNTON AND BARNSTAPLE RAILWAY.

Photo.] TRAIN APPROACHING LYNTON STATION. [*E. A. Gurney-Smith.*

This interesting line of 1 ft. 11½ in. gauge is to be taken over by the London & South Western Railway Company.

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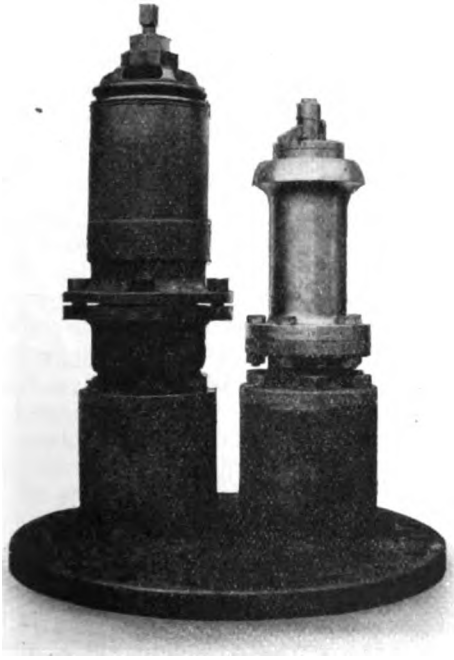
The Original "Ross" Safety Valve for Locomotives.

IN the February number of the RAILWAY MAGAZINE, there appeared, in the "Why and Wherefore" column an enquiry from Mr. G. M. McKay as to which railway was the first to use "Ross" Pop Safety Valves. At the time we were unable to satisfy this inquiry, but have since been in communication



AN ORIGINAL ROSS "POP" SAFETY VALVE AS MADE IN 1901 AND FITTED TO ENGINES ON THE BELFAST & NORTHERN COUNTIES RAILWAY, AND A MODERN ROSS VALVE.

with Messrs. R. L. Ross & Co., Limited, the patentees and manufacturers of the valves, from whom we learn that the first "Ross" safety valve was made towards the end of 1900, or early in 1901. About that time Mr. Ross was Engineer of the Portrush & Giant's Causeway Tramway, and engine No. 57 of the Belfast & Northern Counties Railway (now Midland Railway, Northern Counties Committee) was running fitted with Ashton "Pop" safety valves. This engine was sent to Coleraine Shed, and often ran into Portrush. Mr. Ross's attention was attracted to the valves, and he decided to think one out of his own.

Mr. H. P. Stewart, Assistant Locomotive Engineer, of the Northern Counties Committee, in a letter on the subject, says that in course of time the valve evolved by Mr. Ross was mounted upon engine No. 57, opposite to one of the Ashton valves, so that the boiler was then equipped with one Ashton and the original "Ross" valve, and the photograph reproduced on this page shows the "Ross" valve of 1901 alongside one of the latest pattern as applied to locomotives to-day.

We have also received a blue print showing the detailed arrangement of one of the earlier valves in section, and although this is not exactly the same as the one in the photograph, it doubtless approximates to the general arrangement of the earlier patterns, with the exception that it was designed more or less to suit marine type boilers. Mr. Ross was originally a marine engineer, and he was probably in this instance trying to get out a valve suitable for marine boilers. The drawing is numbered "1" and, therefore, would appear to represent the details of the earliest "Ross" valve.

The old type of valve as shown in the photograph, must have been somewhere approaching 2 ft. 3 in. in height, whilst the present-day pattern shown at the side would be 16 in. in height. To meet present-day requirements, it is necessary to reduce the height of safety valves very considerably, and Messrs. Ross inform us that they are now faced with the proposition of bringing the height of valves down to about 6 in., and further that they have been able successfully to accomplish this. Other valves, 10¾ in. in height, have recently been fitted in considerable numbers to locomotives of the latest patterns with high-pitched boilers.

It is worthy of note that the turner and fitter who did the work for Mr. Ross on the first safety valve are still in the

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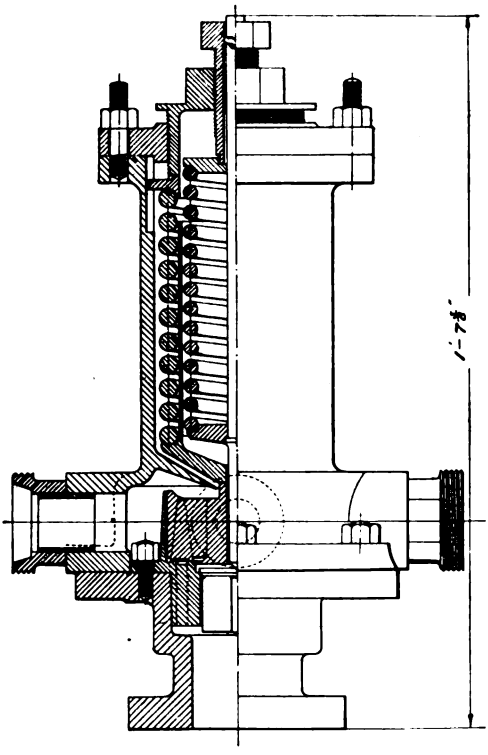


AN EARLY FORM OF THE ROSS "POP" SAFETY VALVE.

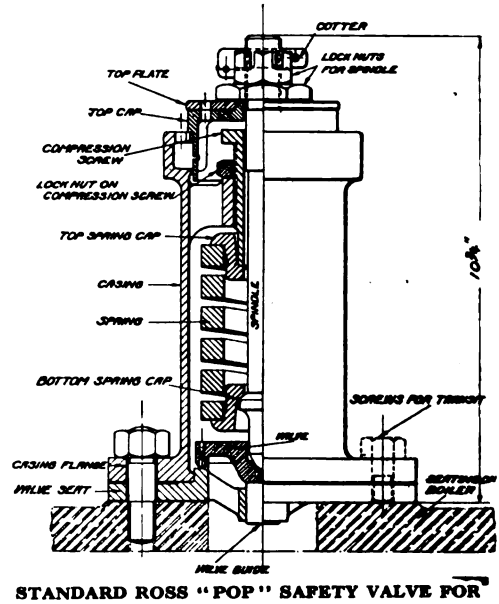
service of the Northern Counties Committee, and that Mr. Cochrane, the present foreman of the works, was at that time a pupil. The original valve was produced from a pencil drawing made by Mr. Ross, and he personally looked after the work during its progress. In this particular valve there was one valve placed above another, the upper one being perforated. Thus it can be claimed that the Belfast and Northern Counties Railway, as it then was, was the first, not only to use, but to make the "Ross" pop valve.

Mr. Bowman Malcolm, the Locomotive Engineer at the time (1901) still retains the position of Engineer and Locomotive Engineer of the Railway, and we are indebted to him and also to Mr. H. P. Stewart, his assistant, for the information relating to the part taken by the Railway Company in producing and using the first Ross pop safety valve on a locomotive.

The "Ross" Pop safety valve, in its latest form, is shown in another of the accompanying reproductions. The height of this is 10¾ in. overall, as shown. The spring is held between the top and bottom spring caps, which latter are made with internal radial faces, so that the spring can take up its natural vertical position.

A perfectly free motion is assured by providing a clearance between the spindle and the hole in the compression stud, and a clearance is also allowed between the outer rim of the top cap and the hole in the casing, so as to allow a free escape for part of the steam. A slot is made in the top cap, so that part of the steam can escape freely and thence through the holes in the top of the casing to the atmosphere, but the holes in the top plate are so arranged as to be adjustable over those in the top cap. A peg is provided in the top plate, so that it can be located in different positions with the holes in the top cap; thus allowing a variable number of holes to be open and shut.

A clearance of about $\frac{1}{32}$ in. is allowed for between the bottom lock nut and the top plate, so as to make sure that the whole of the downward pressure exerted by the spring is transmitted to the valve itself. The general action of the device is clearly shown by this drawing.



STANDARD ROSS "POP" SAFETY VALVE FOR LOCOMOTIVE ENGINES.

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Train Indicator Time-Tables.

FOR many years the need for a really informative train indicator for use at railway stations has been recognised, and many types have been introduced, some used to a considerable extent, others making a tentative appearance, and though they may have continued in use, have not been multiplied. A further need is to provide a means whereby passengers can be informed in a simple and clear manner as to the times of trains for particular destinations or routes, without need for tracing them out from time-tables, which, for other than straightforward journeys, are necessarily somewhat confusing to many people, and may involve tracing a journey from one table to another. Indeed, railwaymen at country and intermediate stations are not always expert in regard to journeys beyond the limits of their own districts, and there is a considerable amount of truth in the suggestion conveyed by the following incident, overheard at a country station :—The stationmaster's clerk, an obliging junior, had disappeared for some time. On his return the stationmaster asked where he had been. The clerk explained that he had been helping a passenger to trace out the train service on another line. To this his chief replied, impatiently: "Why did not you give the passenger the time-table and let him find out for himself?"

As a rule railwaymen are ready to give all the assistance they can, but frequently there is also the further difficulty that between the public issues of time-tables and time-sheets for exhibition at stations there are incidental alterations and additions by public notice, so that the time-tables and time-sheets have to be considered in conjunction with supplementary notices, which may easily be overlooked by the unfamiliar traveller.

A type of indicator which approaches most nearly to the desideratum is that introduced by Messrs. Benn and Cronin, Limited, of 11, Borough High Street, London Bridge, S.E. 1. This owes its inception largely to the sympathetic support of chief officers of the London, Brighton & South Coast Railway, and the first indicators were installed at the railway station at Bexhill to meet the local competition by tramways. The original requirement was that the indicator should be readily adjustable to any alterations in the train services and should be easily visible at a reasonable distance. A further point was that it should give not merely the next train for a particular route or destination, but should cover the whole train service, corrected from day to day if need be, in a dissected form. On this basis the scheme of collecting the train times in classified groups was decided upon, built up in sections, wherein each train time is made up of separate elements—single numerals, letters, words, &c., as required —adapted for easy alteration individually and without affecting any other part.

A view is reproduced showing the first indicator—that erected at Bexhill in 1915—and this illustrates the main features as adapted to meet the needs of a relatively small station involving only a few routes. This type of indicator has, however, been adopted also at many of the large terminal and junction stations, in which case the sections are usually placed in two or more groups, separated by an artistic advertisement panel, or fitted round ticket or other windows, or even doorways, so that where a large amount of information has to be given the sections are separated to avoid any sense of confusion and to cause passengers consulting the indicators to distribute themselves sufficiently to obviate crowding.

The special constructional features of these indicators are covered by letters patent. Briefly, a number of frames of suitable dimensions are combined within a main frame, each section being separately removable on releasing a lock, and containing a series of grooves in which enamelled plates carrying words, numerals or letters, with blanks of varying sizes, are placed as required, the ends of the grooves being closed by hinged side pieces, so that numerals, letters or words in each line can be individually altered as need arises. Each main frame includes as many smaller frames as desired, and is shaped and dimensioned to suit the

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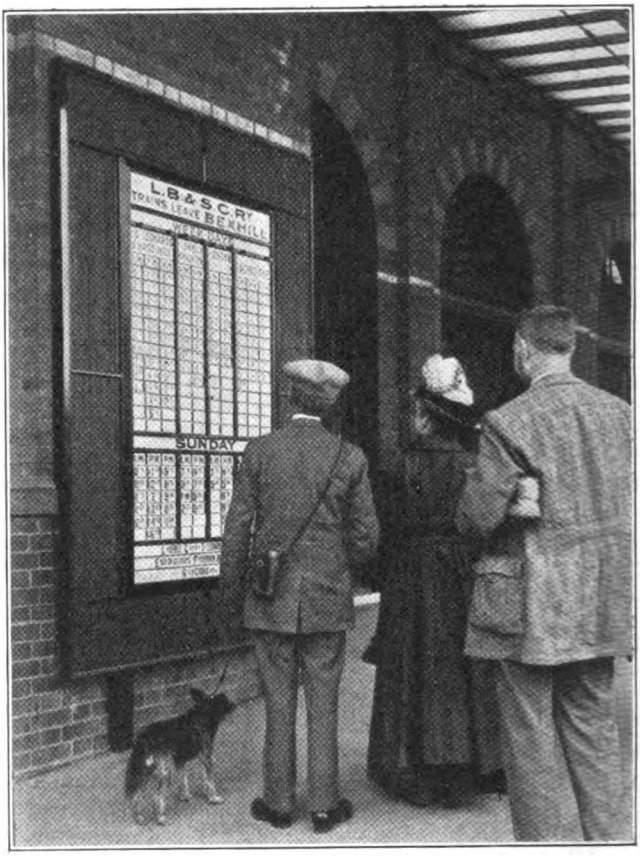
position selected for erection, usually along the wall of a booking office, on the station wall, either outside or inside, but necessarily protected from rain (for the benefit of passengers referring to it), or an indicator standing in the circulating area of a station.

Under a main heading bearing the name of the station and the words "Trains leave this station," is a sub-heading, "Weekdays," and below that a series of sectional frames, each individually removable. These are headed by the names of stations served by the trains detailed below, or a general description of the service; next comes the platform number or letter if required to be set forth, and below that again the times of all trains on the service concerned. These times are built up of separate numerals (in black), grouped with letters or signs (in red) referring to footnote explanations below as required, with spacing pieces. Usually the frames are designed for the full summer service of trains, blanks being substituted in spaces which are not required as the train service is reduced, so as to be available for use again in due course. In each separate groove, however, individual plates can be taken out for alteration as required without affecting any other line, as permitted by the hinged side pieces of the frame.



THE FIRST INDICATOR ERECTED AT BEXHILL, L.B. & S.C.R.

Frequently, if the trains are not very numerous, a single sectional frame will contain two or three headings and groups of train times below; but each sectional frame is kept to moderate dimensions so that it can be easily manipulated. Below the weekday frames are others for the Sunday services, which are usually kept quite distinct, and at the base various footnote references, such as S = "Saturdays only," E = "Saturdays excepted," P = "Pullman car," &c., are set forth.

In construction the indicator includes only a main frame, into which the sectional frames, whose sides are hinged to enable the numeral, letter or blank plates readily to be taken out for alteration, are secured by locks or other fastenings. For keeping a supply of spare plates provision is made behind the footnote section by dividing the back of the indicator into a sufficient number of pigeon holes to carry a spare quantity of each numeral, stocked in numerical order. The whole of the exposed framework is usually constructed in Indian teak, thus rendering it practically fire and waterproof.

During the war the Benn & Cronin indicators showed their value in a marked degree. Public time-sheets could not be obtained from the printers by the dates altered schedules came into force, while public time-tables were not issued. Yet, on the basis of staff time-tables and information sent down from headquarters,

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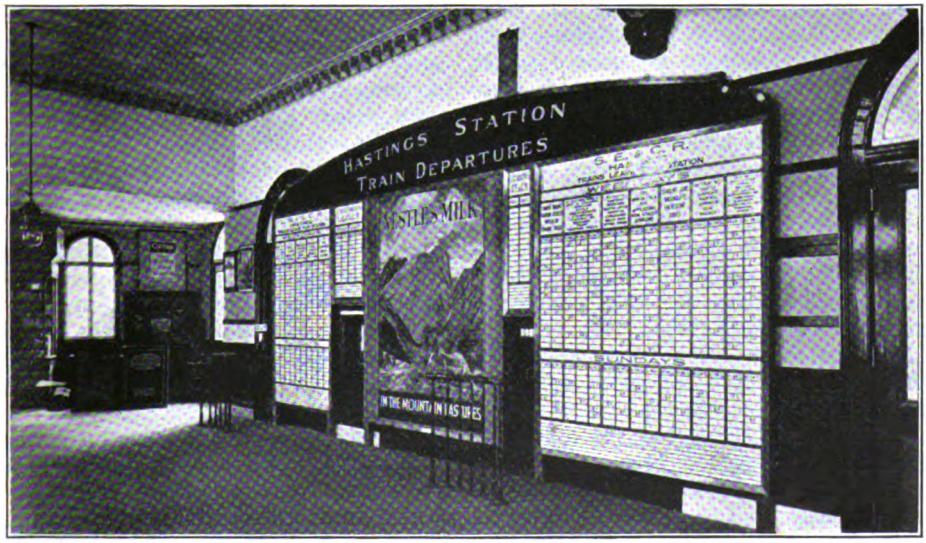
these indicators could as readily be corrected, as the day for alteration came round, as under usual conditions, with the result that at many big stations on the Brighton Railway system there were, on the first of the month, and especially when big reductions or alterations were expected, as on January 1, 1917, "indicator queues" of people noting the train services which concerned them. Such conditions no longer apply, of course, but the value of the indicator is the same—on the day a new time-table comes into force the necessary alterations can be quickly made by the stationmaster and a leading member of his staff, or by others who may be deputed for the task, and, in addition, the alterations otherwise included only in "train alteration" slips or posters can be made at any time, whether new time-sheets and time-tables are issued or not. Incidentally, while on alteration dates a certain amount of work is given to responsible members of the station staff, this is much more than compensated for by the almost complete elimination of inquiries from the travelling public.

The great feature of the indicator is that any line can be altered in a few minutes, each section being separately removable, and the time-table can thus be kept absolutely up-to-date. Indeed, on the day before a train alteration comes into effect, on a Saturday preceding a Monday or on a Sunday preceding the one concerned, the change can be made as soon as the train affected has gone for that day, and not infrequently this is done for all morning trains during the afternoon of the last day on which they run as previously shown. In fact, in large measure, these indicators render time-tables and time-sheets unnecessary for ordinary reference purposes. As the train times are collected for each destination or route the time-table is, in effect, dissected according to all requirements which can reasonably be anticipated and provided for. This appeals especially to women passengers, to many of whom an ordinary time-sheet or time-table is a source of bewilderment, and it is a convenience to everyone. It has been suggested that the "next" trains should be specially identified, but an important feature of the Benn & Cronin indicator is that it shows the complete service, already dissected from others with which the "referee" is not concerned. It is,



BENN & CRONIN TRAIN INDICATOR AT HASTINGS.

London, Brighton & South Coast and South Eastern & Chatham Railway train service panels fitted around the respective ticket windows.

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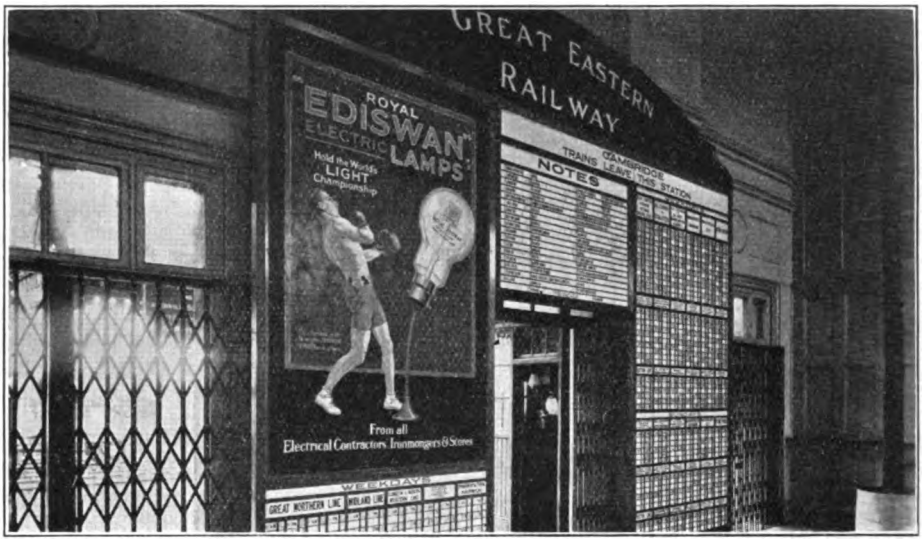

BENN & CRONIN TRAIN INDICATOR AT CAMBRIDGE.

Showing Great Eastern Railway and other train services. Panels arranged around and between entrance gates.

therefore, often consulted by arriving passengers with a view to noting the times of return trains later in the day.

The actual design and arrangement varies, of course, according to each location. Thus, at smaller stations, there may be only a single composite panel, but usually at least two are used, combined with an artistic advertisement, as already mentioned, to form, with a suitable head-board (which may include a clock face, the name of the station and railway, &c.), an ornament as well as an adjunct to the booking hall or circulating area of a station. Colour is introduced by the advertisement panel and sometimes by the heading, but all timetable information is on white enamelled iron, bearing black or red numerals, letters, &c. Other colours can, of course, be utilised, if desired, but, as a rule, it is found that red or black is quite sufficient. In fact, as multiplication of colours adds seriously to the stock of numerals, letters, &c., required for each indicator, it is found to be best to show all train times in black numerals on a white ground; reference letters, platform numbers, conventional signs to denote express, Pullman or restaurant car trains being in red on white. The weekday and Sunday services are, of course, shown separately. Explanations of references used may be placed below the panels to which they apply, but they are sometimes placed in other convenient positions. Sections may also be devoted to excursion train arrangements, and occasionally special notices are inserted in spaces not immediately required. It is, of course, possible to show the platforms from which trains depart or at which they are scheduled to arrive. In regard to the latter, in some of the more recently installed indicators an arrangement is adopted whereby the plates showing the platform number can be changed without requiring the whole section concerned to be removed. This provides for cases where a train which ordinarily uses a particular platform has on any particular day to be altered to another, and for changes at short notice.

In addition to their standard use, these indicators can also be adapted for associated purposes. For instance, as shown in one of the illustrations, at the Talbot Road and Central stations at Blackpool, London & North Western Railway, a Benn & Cronin indicator, adapted to the requirements of heavy

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BENN & CRONIN "ALL WEATHER" EXCURSION TRAIN INDICATOR ERECTED AT BLACKPOOL (CENTRAL) STATION.

(Reproduced by permission of the London & North Western Railway.)

excursion traffic, has just been installed. These have been introduced for the excursion platforms of each station, and, instead of showing train services, give particulars of the numerous return excursion trains required every day throughout the summer months and at holiday times for Blackpool traffic. These indicators are necessarily on a large scale and are constructed on the same lines as the time-table indicators. They show, however, the official train numbers, names of principal destination stations, time of departure and platform number, prepared according to the requirements of each day. Under the headings of train number, time of departure and number of platform, the panels are of the new swing type mentioned above, to cover alterations at short notice, and, as a rule, it is sufficient to alter these without unlocking the larger panels, it being necessary only to release the swing hinge at the top edge of the number plates. About 80 trains can be shown on each indicator. These indicators are of an "all-weather" type, and are provided with sliding glass doors, formed in three sections, running on rollers, the centre door sliding in front of those on either side, so that the glazed section covering any one of the three sections can readily be moved sideways to allow access to the portion which it normally covers and protects. Glazed covers of this type are also used for the ordinary time-table indicators where they may need to be placed in the open, especially where they have to be installed on other than railway premises. For example, where a railway station is some distance from the centre of a town, an indicator is erected in the market place or other prominent position, so that prospective passengers can obtain railway information without having to go to the station or hunt up a printed time-table. Such indicators, when installed on other than railway premises, have the further advantage that they are exhibited as a rule at centres of tramway and road traffic, and their presence will frequently bring to mind that the railway provides facilities for travelling to places also served by road.

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As showing the wide applicability of the Benn & Cronin type of indicator, two views are reproduced showing interesting examples of their application to meet particular requirements. One shows an indicator installed at Hastings. In this case the train panels are placed adjacent to the ticket windows used respectively by the London, Brighton & South Coast and South Eastern & Chatham Railways, with excursion panels over the respective ticket windows. Another view shows an indicator at Cambridge station, Great Eastern Railway. In this case the indicator is fitted around and between the gateways controlling access to the platforms, explanatory notes and excursion announcements appearing over the centre gateway. The indications applying to Great Northern, Midland, London & North Western and Great Northern and Great Eastern Joint Line services, together with times of Continental traffic trains, are placed below the advertising section. At Guildford station, London & South Western Railway, three time-table panels and one advertising panel are fitted round a somewhat awkward corner in the booking hall. At many stations two or more of these indicators are required in the various booking offices or at each entrance, if there is more than one. The indicators at each position need not be exact duplicates. Frequently it is found better to place the panels most in request at one part of the station in the more prominent positions, and in some instances it may be sufficient to give only partial particulars. Thus, at Cambridge, besides the main indicator in the booking hall, there is a supplementary one on the platform, designed more particularly for platform reference and to guide passengers to the individual platforms.

Indicators of this type have already been installed in large numbers, ranging from examples such as that at Manchester (Victoria) station, which gives particulars of no less than 1,350 train times and covers the departures from 17 platforms, to small indicators giving information in regard to a few trains only. They can also be applied not only as departure indicators for excursion trains, as at Blackpool, but also for the purposes of ordinary train departure and arrival indicators at large terminal and junction stations generally

BENN & CRONIN "ALL-WEATHER" INDICATOR ADAPTED FOR EXCURSION TRAIN ANNOUNCEMENTS AT BLACKPOOL (TALBOT ROAD) STATION.

(Reproduced by permission of the London & North Western Railway.)

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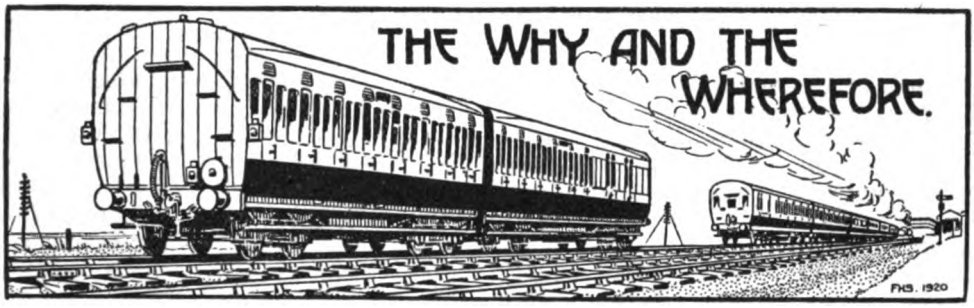

RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions and weights of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. No reader should send more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, the pages of the "Railway Year Book" should be consulted. The twenty-fifth Annual Edition of this standard railway reference work is on sale at 5s. net, or by post, from the* RAILWAY MAGAZINE *Offices, 33, Tothill Street, Westminster, London, S.W.1, to any part of the world, 5s. 9d.*

Colours of Great Western Railway Rolling-Stock.

We understand that until about 1855 passenger carriages on the Great Western Railway were painted in distinguishing colours for the respective classes, but we have not been able to ascertain exactly what these colours were or when the brown lower panels and white upper panels were first adopted. An old Great Western Railway man, Mr. J. B. N. Ashford, now of Plymouth, mentions that, according to his recollection, the South Devon and Cornwall Railway carriages about 1868 were painted light brown all over, though a few had black panels between the windows, and the first class carriages had the upper panels outlined with black and white lines. He also states that the Bristol and Exeter carriages were painted somewhat similarly to the present North Eastern Railway colours, and in the early 'seventies he remembers seeing the window panel portions of some of these coaches painted white. About 1873 the South Devon Railway had some carriages not painted but varnished only.

[Reply to A. J. MAXWELL.]

"Underground" Railway Loading Gauges.

On the Metropolitan and Metropolitan District Railways the loading gauges substantially correspond, the limits usually being 12 ft. 6 in. or 12 ft. 8 in. extreme height, and 9 ft. extreme width. Other railways sending rolling-stock or engines on to these lines, as in the case of Midland, Great Northern and Great Western trains working over the Metropolitan Railway, have to conform to these dimensions. London and North Western and London Electric Joint electric trains working through over the Baker Street and Waterloo section of the London Electric Railway are restricted by the size of the tubes to be traversed; hence they are much smaller than the London and North Western electric rolling-stock used on other routes.

[Reply to J. MALLET.]

"Cosmopolitan" Railway Stations.

Mr. Edwin B. Huddle, of Chicago, mentions the following towns in the United States having railway stations used by seven or more companies, the number of companies using each station being given in parentheses: St. Louis, Missouri (21); East St. Louis, Illinois (15); Kansas City, Missouri (12); Peoria, Illinois (11); St. Paul, Minnesota (9); Omaha, Nebraska (8); Toledo, Ohio (8); Polk Street station, Chicago (8); Birmingham, Alabama (7); Dallas, Texas (7). Of the stations mentioned, only three are found in the leading 25 towns, each containing a population of 250,000 or more, the absence of the larger cities being due to the fact that they are served by several railway stations or by a few companies having a greater number of lines.

[Further reply to T. W. LINSELL.]

Locking Railway Carriage Doors.

Hundreds of patents have been granted for preventing railway carriage doors from

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opening during running, but none appears to satisfy practical requirements, while the need is really not a serious one. The best safeguard is the use of double catch locks, several patterns of which are already in extensive use. The most popular in Great Britain and in the Colonies are Kaye's patent automatic railway carriage door wedge locks. The North Eastern Railway 4-6-2 locomotive will be illustrated in the RAILWAY MAGAZINE when it is completed.

[Reply to H. F. WICKINGS.]

Naming Locomotives.

The policy to be adopted is generally decided by the directors; the actual names to be used is a matter of arrangement, being usually in the hands of the locomotive department, though probably the directors and the general manager will indicate their desires in any particular connection. Double heading of apparently light trains is usually due to the difficulty of arranging return workings within the hours of duty of enginemen.

[Reply to E. M. and E. B. SOWRY.]

Earl's Court Junction.

The terminal line you mention is used for reversing London and North Western Railway electric trains and District trains which terminate at Earl's Court. Were this line continued, as suggested by you, it would be necessary either to reverse these trains on the running lines or to extend them to High Street station. London and North Western Railway running powers do not at present extend to High Street station.

[Reply to J. MALLET.]

Passenger Traffic at Waterloo.

The approximate figure given in the May, 1922, RAILWAY MAGAZINE, was 186,000 passengers using Waterloo Station daily. We have no detailed statistics as to those transferring to the Waterloo and City and "Bakerloo" lines. It is a number of years since the London Traffic Conference went into matters of this kind, and the figures then given are now out of date.

[Reply to J. MALLET.]

Engine Shed and District Indications.

The small plates you mention, attached to the roofs of the cabs of London and North Western Railway locomotives, indicate the number of the running shed or the locomotive district to which the engine is attached. Similar methods are adopted by a number of other railways and full particulars are included in the 1922 edition of the RAILWAY YEAR BOOK.

[Reply to Capt. W. R. WINTERBOTTOM.]

Departmental Locomotives.

You are right that the *Cornwall* is regarded as a departmental locomotive. For particulars of all these engines, in the case of the London and North Western Railway, we would refer you to Mr. C. Williams' *Register of London and North Western Railway Locomotives*, published at 73, Chetwode Street, Crewe, and stocked at the Offices of THE RAILWAY MAGAZINE, price 3s. 6d., by post, 3s. 8d.

[Reply to T. H. SEWELL.]

Midland 0-10-0 Locomotive No. 2290.

We have heard nothing suggesting that this engine is to be used for heavy goods traffic between Derby and London, and very much doubt whether, owing to its weight, it would be allowed to make such journeys. The "minor searchlight," as you call it, is, we believe, used for indicating purposes in the working of traffic up and down the Lickey incline.

[Reply to W. N. HILL.]

Equivalent Heating Surface.

This term is used, we understand, in American practice to denote the mean between the exterior and interior surfaces of the tubes in a locomotive boiler, which, in the aggregate, may involve considerable differences, though sometimes one and sometimes the other is used in giving heating surface statistics.

[Reply to R. B. ABBOTT.]

"T.P."

These letters, now frequently seen painted in large size on various French rolling-stock, stand for "Travaux Publics." The locomotives and rolling-stock in question have been purchased by the Minister, chiefly, if not entirely, from the Americans. These now have been distributed to the various companies.

[Reply to S. H. DU P.]

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Great Western Railway Trains at Liverpool Street (Met.).

A number of Metropolitan electric trains use the terminal bay as well as Great Western trains worked by Metropolitan electric locomotives. The terminal line at Moorgate Street is not now used regularly, though it is, of course, available to meet emergency conditions.

[Reply to J. MALLET.]

Line under Repairs.

Apparently the board you noticed is one used to indicate that a section of line is being relaid or repaired, and gives warning of the need for speed reduction while traversing the section. The two lamps are for night use and show one white and one green light.

[Reply to J. REVANS.]

Cambrian 4-4-0 Locomotives.

Engines *Beaconsfield* and *Hartington* (not *Lord Beaconsfield* and *Marquis of Hartington*), were described by Mr. E. L. Ahrons on page 334, RAILWAY MAGAZINE, May, 1922. They were similar to the locomotive illustrated on page 335 of the same issue.

[Reply to H. T. W.]

City and South London Railway.

Incorporated as the City of London and Southwark Subway in 1884 for an underground railway consisting of two separate tunnels, extending from King William Street, near Monument Station, to the Elephant and Castle. For full particulars see RAILWAY YEAR BOOK, 1922.

[Reply to RONALD KEYES.]

Light Railways and Grouping.

The railways you mention are all of a "light" character, and light railways are expressly omitted from the grouping. Some of them will possibly be taken over in due course, but this is not required by the Railways Act, 1921.

[Reply to T. H. SEWELL.]

Speed Indicators.

The device you noted attached to one of the rear coupling pins of London and North Western 4-4-0 engine No. 238, *F. W. Webb*, was no doubt a speed indicator, worked by means of the small crank attached to the coupling pin.

[Reply to E. J. GITMAN.]

Australian North to South Railway.

A railway is being built to cross Australia from north to south, and good progress is being made, though there is still a long intervening portion yet to be made. See RAILWAY YEAR BOOK, 1922 edition, for latest particulars available.

[Reply to E. F. S. HARRIS.]

Belgian Locomotives in Germany.

Your assumption that the 0-6-0 Belgian locomotives you saw in a German works were being repaired under Reparation terms may be correct; more probably the German firm were doing the work as a business contract.

[Reply to F. W. S. J.]

London Suburban Services.

We are not aware of any book dealing specifically with London suburban services. Probably the most complete contributions on this subject are to be found in back volumes of the RAILWAY MAGAZINE. [Reply to H. S. GREATOREX.]

Ridge Bridge Station.

We have never heard of a station bearing this name, nor can we trace a place which might have given its name thereto. Possibly readers can throw some light upon this point.

[Reply to H. S. GREATOREX.]

Lancashire and Yorkshire Section Locomotives.

No doubt some records of runs wherein locomotives of the late Lancashire and Yorkshire section have worked trains upon the old London and North Western system will be included by Mr. Allen in due course.

[Reply to G. B. D.]

Electric Railways.

For details of electric railways in the British Isles, see pages 56–57, table on 22, and references in Historical Sketches of Various Railways, RAILWAY YEAR BOOK, 1922 edition.

[Reply to F. S. HARRIS.]

Highland Railway Locomotives.

We are not aware that any other locomotive beside No. 53 has been fitted for burning oil. Forres Junction as a triangular station has been mentioned by another correspondent.

[Reply to A. J. T.]

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Hollinwell and Annesley, Great Central Railway.

This station, between Hucknall and Kirkby, is used exclusively by colliers at the adjacent colliery, and workers in the Annesley marshalling yard and locomotive sheds. [Reply to J. V. HALL.]

Plymouth-London Ocean Specials, Great Western Railway.

Special trains between Plymouth and London, in connection with Transatlantic steamers, are run when there are a sufficient number of passengers to warrant them.

[Reply to "WICKET."]

Colour of Locomotives, Great Eastern Railway.

Grey will probably be retained until the formation of the Eastern Group of Railways is complete, when a standard for the whole group will doubtless be laid down.

[Reply to F.A.H.]

Hammersmith and City Railway.

Goods and milk trains are worked to both Addison Road and Hammersmith by steam engines over this route, the former in the small hours.

[Reply to G. R. SOUTHERDEN.]

North British Railway Locomotive Classification.

Small letters on the side of North British Railway engine cabs indicate the way in which they are grouped according to their tractive power.

[Reply to "BORDERER."]

The Railway Groups.

Your suggested titles for the four great railway groups are interesting, but there is little point in attempting to anticipate the titles which will be adopted ultimately.

[Reply to R. S. MILLER.]

Locomotive Safety Valves.

For many years Midland locomotives had Salter safety valves on the steam domes, and Ramsbottom valves above the firebox. [Reply to W. JAMES.]

Newcastle-Swansea Express.

This is worked by North Eastern Railway locomotives north of York and by Great Western Railway locomotives south of Banbury.

[Reply to "SIGNAL BOX."]

Steam Engine, Central London Railway.

There is one steam engine of the 0-6-0 condensing side-tank type kept in reserve on this line. Your second query contravenes the rules.

[Reply to D. CAMPBELL.]

Shrewsbury and Hereford Line.

Locomotive running over this route was dealt with at length by Mr. Cecil J. Allen in his articles in the issues for May, 1917 and February, 1918.

[Reply to "GREAT BEAR" and "TITLEY COURT."]

Bisley and Brookwood Line.

This is the property of the National Rifle Association, but it is worked by the London and South Western Railway.

[Reply to F.H.V.P.]

London and South Western Railway Locomotive Performance.

Dealt with at length by Mr. Cecil J. Allen in the March, 1920, and November, 1921, issues.

[Reply to T. F. PEACHEY and F. D. MILLARD.]

Midland & South Western Junction Railway.

Locomotive and rolling-stock colours are both crimson lake on this railway. See RAILWAY YEAR BOOK.

[Reply to "DOME."]

Slip Coaches.

These were first introduced on the London, Brighton and South Coast Railway, about 1858.

[Reply to X. Y. Z.]

Wakefield Anti-Carboniser.

Located on the oil-feed pipes leading from the mechanical lubricator, generally against the smokebox side.

[Reply to G.M.H.]

Arched Corrugated-Iron Station Roofing.

We cannot call to mind any other examples of this type of roofing than Crouch Hill and Holloway.

[Reply to "CROUCH HILL."]

Kensington High Street.

Branch on west side of line without electrified rails, to the south of the station, leads to the Midland coal depôt.

[Reply to W. M. SHAWE-TAYLOR.]

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Converted Compound Locomotives, London and North Western Railway.

The 4-4-0 passenger locomotives are nearly all now running as inside cylinder locomotives with two cylinders only.

[Reply to W. LENDON.]

Superheated 4-4-0 Compound Engines, Midland Railway.

Bogie wheels of these engines are not braked. Lubricator is located on left-hand side, ahead of leading splasher.

[Reply to D. M. BURCHALL.]

Hanwell Loop (Drayton Green-Hanwell) Great Western Railway.

There are no booked passenger workings over this curve, but it is used by empty coach trains and also goods trains.

[Reply to "PEACOCK."]

Hatton North Curve, Great Western Railway.

Only present booked working over this curve is the 8.30 a.m. passenger train from Stratford-on-Avon to Birmingham.

[Reply to J. F. READE.]

Tractive Force of Locomotives.

This formula has been given so many times that we must refer readers to back issues.

[Reply to D. BARRETT and others.]

2-6-0 Engines, Great Eastern Railway.

A series of 15 2-6-0 goods engines ran on the Great Eastern Railway from 1879 till about 1887.

[Reply to "MOGUL."]

Midland Railway Large Locomotive Numerals.

Practice of painting large numerals on tender and tank sides began in 1905.

[Reply to "BARROVIAN."]

London and North Western Railway 4-4-0 "Moorhen."

Apparatus at the leading end is the Weir feed-water heater and pump.

[Reply to G. P., H. S. HACK, & H. SIMPSON.]

4-6-0 Engines, Midland Railway.

We know of no 4-6-0 engines of Midland design running on this system.

[Reply to H. T. TESTAR.]

CROSSING THE CANADIAN "ROCKIES."

Photo.] [*C. R. Littlebury.*

EASTBOUND "TRANS-CANADA LIMITED" EXPRESS, CANADIAN PACIFIC RAILWAY, ON FIELD HILL, BRITISH COLUMBIA.

4-8-2 locomotives Nos. 5806 and 591, Mount Ogden in background.

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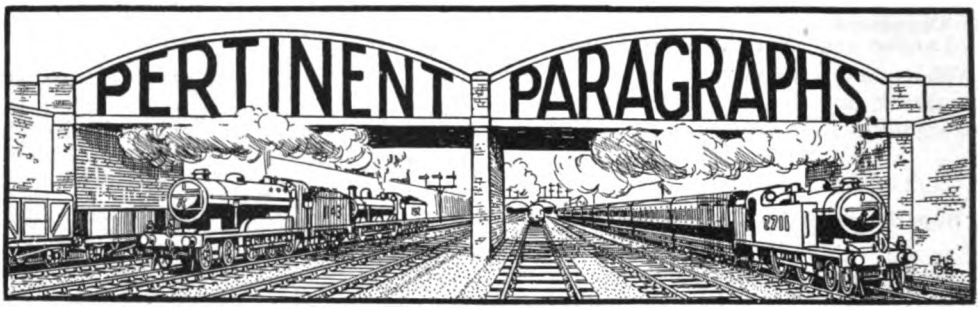

"Robinson's Railway Time Table," 1841.

An old contributor, to whom the guide of the above name and date has been lent, sends us the following particulars. Published at the office of the *Railway Times* (then at 122, Fleet Street) this guide "at present"—*i.e.*, in 1841—"the most comprehensive guide for the railway traveller yet published," gives a page of "Instructions to Railway Travellers" in the best early-Victorian style; based plainly on the notion that the "rail-faring man" is "a fool." Though "comprehensive," the tables are hardly complete, *e.g.*, the Canterbury and Whitstable line, though it had been open then for over 10 years, is not mentioned.

The cradle of British railways, Co. Durham, had a remarkable number of lines already in operation; of these, one name will be new to most readers, viz., the "Brandling Junction Railway": even in 1845 it had been absorbed by the "Newcastle and Darlington" Company, itself worked as one system with the "Great North of England"—York to Darlington—line. As both of these were merged in, first the "York, Newcastle and Berwick," and then in the "North Eastern" of to-day, the existence of this "Brandling" company is unknown to most living railwaymen, and the present writer must own to have never heard of it hitherto.

It seemingly ran from Durham (with perhaps through trains over the Stockton and Darlington Company's line to and from Stockton) to Gateshead—the Tyne was not bridged at Newcastle till much later—and also to South Shields and Sunderland, and *vice versa*. Though not shown in the actual time-table (the stations there given are Rainton, Fence Houses, Pensher—now spelt "Penshaw"—Washington, Boldon, &c.) the junction station was "Brockley Whins." This can hardly have been the intermediate station now bearing that name on the Sunderland line from Newcastle; in fact a careful comparison of tables for various dates drives one to the conclusion that it was on the site of the present "Pelaw Junction"; as the station now called "Brockley Whins" is over 3 miles from Pelaw, this seems a rather wild guess, but no other conclusion is possible. The "main line" trains—if there were any such—seem to have kept very poor time, and there is a note (seemingly official) which says: "To prevent disappointment in case the trains should not arrive at Brockley Whinns [*sic*] in time for the Brandling Junction trains, spare engines and carriages will be kept at that station to convey passengers to their respective destinations." These "respective destinations" seem to have been (*a*) South Shields and (*b*) Sunderland; the trains expected to be late were seemingly those from Durham to Gateshead, or *vice versa*, which turned leftwards at "Brockley Whins" (? Pelaw) Junction, giving a threefold connection at that place.

The period from 1841 to 1852 (when the Great Northern main line was open throughout) really covers a time of greater changes in the railway world than the whole period since (say) 1852, has seen. In 1841 it is interesting to note that the London, Brighton and South Coast main line found a temporary terminus at Hayward's Heath, with road vehicles between that point and Brighton. As the South Eastern Railway—then in the making—was not yet open, the section of line between Red Hill and some point south of "Coulsdon and Smitham Bottom" (suburban terminus of the Brighton Company's trains), but north of "Coulsdon and Cane Hill" station was then owned by the London, Brighton and South Coast, whose trains—four each way—actually served Merstham, now for over 75 years a purely South Eastern station. The "Croydon Railway" was still independent, with intermediate stations at New Cross (the terminus and starting-point for *third class* farers); "Dartmouth Arms" (now Forest Hill), Sydenham, Anerley, "Jolly Sailor" (*i.e.*, Norwood Junction), and Croydon; it was years before the word "West" was added to the name of this station. The London terminus (the present London Bridge) was called "Tooley Street"; in the London, Brighton and South Coast tables the same

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station appears as "London"—obviously the "London Station" of "The Young Visiters."

Speaking of station names, the correct name for the present Red Hill Junction was then—in the Brighton Company's tables—"Red Hill and Reigate Road" (there was no station actually at Reigate until some 10 years later); unluckily, they persuaded their South Eastern partners to call the station "Reigate Junction" for a good many years; and even after that stuck to the former name in their own tables until about the middle of the sixties. There seems little ground for thinking that the name "Redstone Hill" was ever that of the station, though undoubtedly it suggested the name of the (quite modern) town of Red Hill, now much more important than Reigate.*

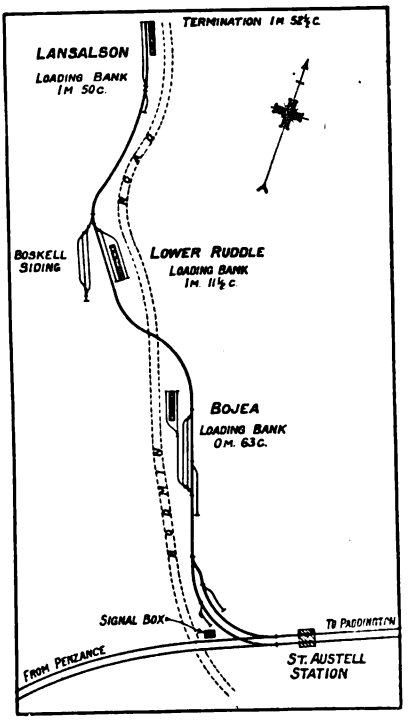
In the "Grand Junction" tables we may note that the station afterwards known as Bushbury Junction figures as "Wolverhampton"; also that on the "London and Birmingham" (now London and North Western) main line, the three stations at which *all* trains called were Tring (not "T. Road," though 2 miles from the small town), Wolverton and Weedon. One train each way was purely for the sake of Midland Counties traffic; as it is noted as having "a special engine" it may possibly have been worked by the—then—M.C.R. throughout; it called at Blisworth both ways, as well as the above-named three "first-class" stations. Apparently *all* "Birmingham and Derby" Company's trains ran via Hampton, *i.e.*, over the London and Birmingham Company's rails for 9¼ miles.

The Great Western was then open from Paddington (old station on site of present goods station) to Bridgwater; there were as yet no expresses, but one down train did not call at Chippenham, and one up passed Slough without stopping. Many trains each way gave "Maidenhead" (the old station on the Bucks side of the Thames) the go-by; one down train called at Hanwell only to West Drayton.

Trenance Valley Line, Great Western Railway.

THE Trenance Valley Branch line of the Great Western Railway was opened last year. It has been built principally for the china clay traffic which, next to coal, is the most important mineral export of the United Kingdom, the quantity produced annually being about 2,000,000 tons. Before the opening of the Trenance Valley Railway the haulage of china clay to St. Austell for loading into railway wagons and of coal in the reverse direction was done by road. Most of the china clay is despatched to Fowey for shipment.

The railway is a single track, 1 mile 52½ chains in length. Commencing with a double junction with the main line, 27 chains below St. Austell, it ascends almost continuously to the terminus at Lansalson, the total rise being 163 ft. It practically follows the course of the road from St. Austell to Bodmin, at first on the east side of the valley, and then, after crossing over the road by means of a bridge at 76 chains, on the west. As



MAP OF THE TRENANCE VALLEY LINE GREAT WESTERN RAILWAY.

might be expected in these circumstances many curves exist, and the whole line is either in cutting or on embankment, the respective totals including cuttings on side-long ground, being 70½ chains and 62 chains. It is an interesting fact that although nearly 70,000 cubic yards of soil were required for forming the embankments practically the whole quantity was obtained from the excavations necessary to form the cuttings.

A particularly noteworthy feature of the line is the small size of the telegraph poles. The telegraph line has been constructed of locally-grown larch poles of scaffolding size. Owing to the present high cost of timber,

* It was in 1858 that the S.E. Co. adopted the more correct name of "Red Hill" for Reigate Junction.

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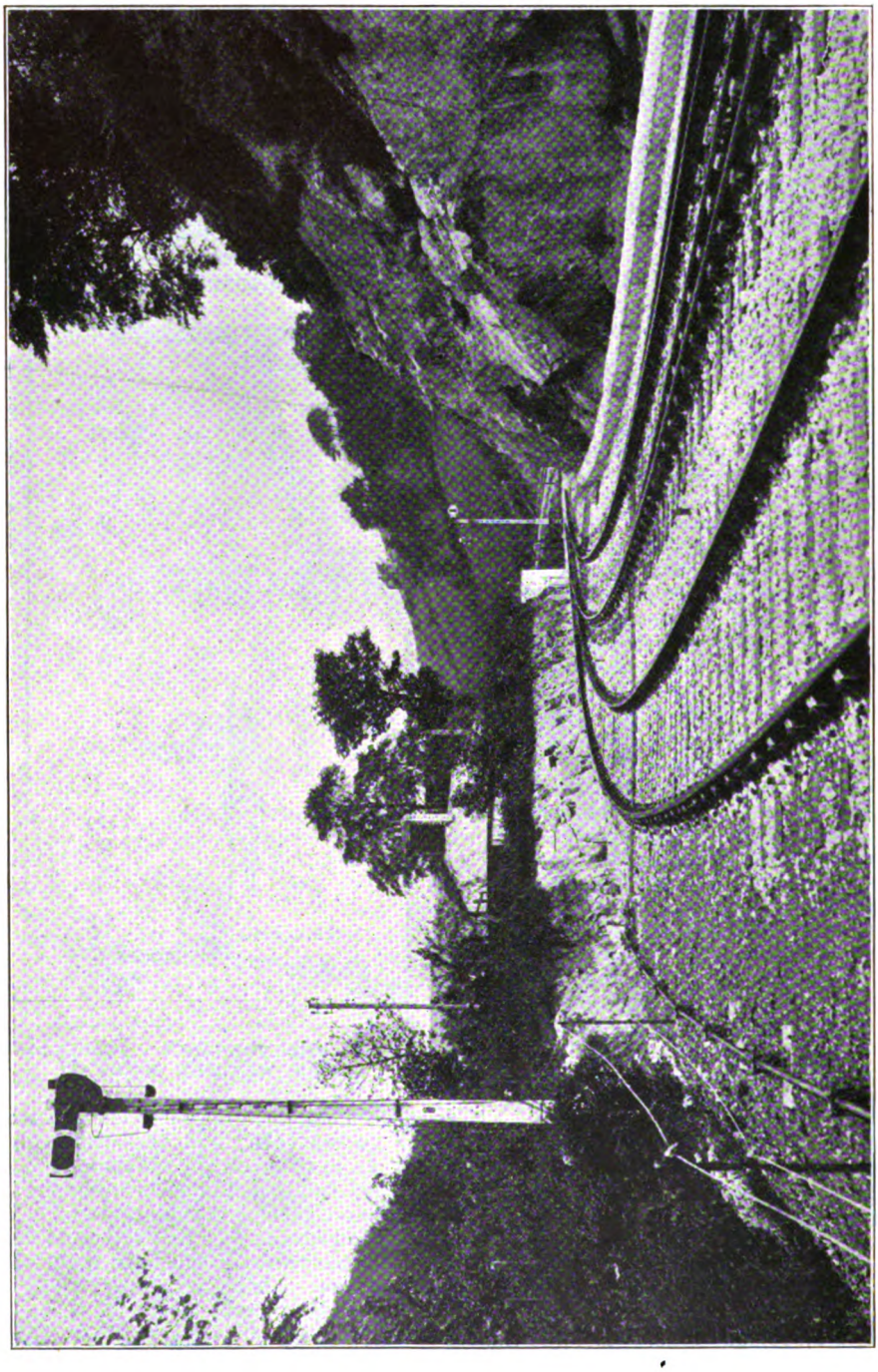

TRENANCE VALLEY LINE, GREAT WESTERN RAILWAY—VIEW NEAR ST. AUSTELL.

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which is especially marked in the case of Baltic poles, some of the sizes having increased in price as much as nine times over the pre-war figures, it is probable this will have an important bearing on the question as to extending the use of cables in place of open wires.

We are indebted to Mr. Felix J. C. Pole, General Manager, Great Western Railway, for the foregoing particulars and the plan and photograph reproduced.

Lickey Incline.

MR. J. RHUTTALL, of Accrington, writes in regard to illustrations and references in recent numbers of the RAILWAY MAGAZINE concerning the banking of trains on the Lickey incline, Midland Railway, involving at times the use of as many as four engines for one train, and comments upon the remarkable work done by the late Lancashire & Yorkshire Railway 2-4-2 superheater tank engines on the Accrington-Baxenden bank, 1¼ miles at 1 in 40, then 1 in 47, and finally at 1 in 100, total length 2 miles. Admitting, however, the remarkable work done by the tank engines mentioned, which is accentuated by the fact that as Accrington station is at the bottom of the bank no assistance can be obtained from a flying start, it must be pointed out that the Midland incline is situated on a main line and trains of main line weights, both passenger and goods, require to ascend the bank in reasonably fast time to avoid unduly lengthy occupancy of the section. We gather that trains worked on the Accrington-Baxenden incline rarely exceed 170 tons as a maximum, and that generally with 0-6-0 goods engines, the usual weight taken by the tank engines being about 140 tons. With heavier loads banking or pilot assistance is necessary.

We quite agree with Mr. Rhuttall's commendatory remarks in regard to Mr. Hughes' superheater 2-4-2 tank engines. We do not think their merits are in any way overlooked, as his letter seems to suggest. The main point is that only when working fast trains is it possible to write up their work in a manner suitable for general reading, though on more than one occasion Mr. Cecil J. Allen has referred to performances by these splendid little engines on relatively fast trains. Mr. Rhuttall mentions also that the tank engines have held their own even when compared with London & North Western "Prince of Wales" class 4-6-0 or other tender engines which are sometimes used between Manchester and Burnley, and when made the subject of comparative tests. He likewise records that it is becoming quite usual to find engines and brake vans which were previously London & North Western working over this and other sections of the late Lancashire & Yorkshire Railway.

Locomotive and Train Working in the Latter Part of the 19th Century: Glasgow & South Western Railway.

ALTHOUGH it is some time since this section of Mr. Ahrons' articles was completed it is clear that they were not only considered at the time, but also since, by many of our readers. One of them, from Paisley, writes:—

"Mr. Ahrons states, in reference to the 'James Stirling' 4-4-0 engines, built 1873–77, that he saw several of them at one time in Kilmarnock station, which had been rebuilt by Mr. Manson with new boilers and cabs, &c., and he added further, that he hoped the veterans would still have a long career before them, and that Mr. Drummond (since deceased) would not be in a hurry to break them up. Well, in this connection I am very pleased to say I have recently seen one of these engines at work between Ayr and Kilmarnock, while another, a short time ago, was regularly employed on local trains between Glasgow and Paisley, but in this instance only temporarily, taking the place of a Manson 0-4-4 tank, which has since reappeared rebuilt with a larger coal bunker, &c.

"Mr. Ahrons also refers to what had always been to him one of the peculiar Glasgow & South Western forms of Chinese puzzles, viz., the lack of tank engines. On this subject all I can say is that his remarks to the effect that consequent upon Mr. Drummond introducing the 0-6-2 goods or mineral tanks a change might be seen, seems to have more or less come true, and if he (Mr. Ahrons) were to pay a visit, say, to Ayr station, he would see a remarkable change in this respect, as there are a great many of the 0-6-2 type continually working in the district, while the bulk of the best and heaviest passenger expresses are now drawn by the new 4-6-4 T class. There are also to be seen others of older design, such as Manson 0-6-0's and 0-4-4's engaged on shunting duties in Ayr Harbour (these being painted black in conformity with what appears to be the standard colour for goods and mineral locomotives at the present time), not to mention occasional Manson and Stirling passenger 0-4-4's.

"With regard to the 4-6-4 tanks, these look like being very successful machines indeed, for the coastal traffic, and I have recently seen one of them on the 5.10 p.m. for Ayr, *ex* St. Enoch, at the head of a train consisting of nine corridor eight-wheelers and a 12-wheeled dining car, which would weigh behind the engine fully 300 tons, as the carriages were packed."

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The North Western and Midland Alliance.

IN reference to Mr. Basil M. Bazley's article in the July RAILWAY MAGAZINE under this title, Mr. G. W. Bishop, of Kenilworth, writes :—

"There is a very curious portion of the Midland system which, I think, might also be included in the list of 'future routes.' I refer to the branch from Whitacre Junction to Hampton. The extraordinary history of this line has already been told in the RAILWAY MAGAZINE—how it was once an important main line of the Birmingham and Derby Junction Railway, forming a through route to the North in connection with the London and Birmingham Railway at Hampton Junction. Also, how the traffic was gradually diverted to other routes until the line dwindled to a single line branch of the Midland Railway, with one passenger and one goods train daily. In that state it was something of a railway curiosity for many years, such a limited train service being unusual in this country. During the war restrictions of 1917 the solitary Hampton passenger train disappeared, as might have been expected. But it seemed very strange to me that, while so many country branches had their rails removed for war purposes this branch, the quietest of them all, was left intact.

"From what I can see of it this is still the case. The little Midland terminus, signal-box, signals and rails are still there. Whether any goods traffic is run I do not know, but the sawmill close by the line is still working, which indicates something of the kind. I understand that this sawmill was once a Birmingham and Derby Junction Railway engine-shed, and that a house near by was occupied by Mr. Matthew Kirtley, whose name lives on in well-known designs of Midland engines. A very historic spot, in fact.

"Whether the Midland Railway had any special object in thus preserving the line, one cannot say, but if this old branch could be restored to double-line (it is laid out for that), and a junction could be made with the London & North Western Railway main line at Hampton-in-Arden, would not a useful alternative route result? Trains could then run from London, Rugby and Coventry to Tamworth, Derby and the North, without touching either Birmingham or the Trent Valley route. If the old branch ever does regain its activity in some such way as this it will furnish another chapter to a very strange railway story. It may be noted that the Midland terminus is called 'Hampton' only, the 'Arden' title being confined to the London & North Western station. The latter is one of two railway stations named after the great Arden forest, the other being Henley-in-Arden.

"With reference to the Stratford-on-Avon & Midland Junction Railway, also mentioned in the article, may I suggest that two other powerful groups are likely to feel a keen interest in the line? Although it is often regarded as having a 'Midland' atmosphere, so to speak, the Great Western is concerned with this railway in some measure. There is the junction for goods exchange at Fenny Compton, and at Stratford the Great Western has a double-line junction worked by a separate signal-box ('Stratford-on-Avon & Midland Junction'), and leading to the Stratford-on-Avon & Midland Junction main line. As a competitor for the London and Stratford-on-Avon traffic the Great Western group may very likely keep a watchful eye upon its Warwickshire neighbour.

"Again, as a partner in the Eastern Group the Great Central Railway may consider the Stratford-on-Avon traffic. For some time there has been an advertised through service from Marylebone to Stratford by means of the junction line at Woodford and Hinton. The two companies apparently have been quite friendly, and I believe a Great Central 'Atlantic' engine has worked through to Stratford. Was there not once a proposal for the 'Stratford-on-Avon & Midland Junction' line to be used as a portion of a Great Central route to Birmingham? In many ways the Stratford line has all the makings of a regular railway battleground of the future, and its coming developments should be very interesting."

Mechanical Appliances at Exeter Tranship Goods Shed, Great Western Railway.

THE Great Western Railway have equipped the tranship section of their Exeter goods shed with a very comprehensive system of hand-operated overhead runways and hoists. In an overhead installation of this kind it is important that any portion of the floor area of an open wagon shall be easily plumbed by a hoist. In the ordinary way this necessitates a high pitched roof to enable a hoist and its suspended load to pass clear over the roof of the box van when travelling longitudinally above a standing train. To avoid a high roof an ingenious arrangement has been installed in the Exeter shed. Each of the two lines of rail is spanned by a short length of runway which is mounted on wheels at either end and can be travelled by hand chain and worm gearing, from end to end of the shed above a train of wagons and vans.

At five points down the length of the shed, long cross lengths of runway are fixed, so that when one or both of the short travelling lengths registers in line with either end of one of these cross lengths a hoist can be run

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INTERIOR VIEW OF GOODS TRANSHIP SHED, EXETER, G.W.R., SHOWING INSTALLATION OF HAND-OPERATED RUNWAYS AND HOISTS.

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from one to the other, as the case may be. The short lengths of runway travelling above the trains are made sufficiently long to overlap the edges of the shed platforms by about 3 ft. A hoist can therefore pick a load out of a wagon standing on one pair of rails; be traversed across the shed on to the travelling runway spanning the other pair of rails and travel on it (over the platform) down the length of a train thereon until the transfer wagon it is destined for is reached, when it can be easily manœuvred over any desired point on the wagon floor and the load lowered into position.

This is, we understand, the first shed in this country completely served by hand-operated overhead runway hoists, and there should be a wide field of usefulness for these facilities. The capital cost of such an installation is appreciably below that of electrically-operated apparatus, and for loads up to, say, one ton, travelling and traversing are done by hand with a minimum of effort, due to all the travelling wheels being fitted with roller bearings. The installation at Exeter was supplied and installed by Messrs. Herbert Morris, Loughborough.

Government Compensation to Railways. Third Scheme of Allocation.

OUT of the first 30 millions due to the railways under the Railways Act, 1921, a sum of £500,000 was set aside for the payment of compensation to companies "who are neither conducting their traffic nor maintaining their undertakings." Any balance of this sum remaining is distributable, together with all interest, in accordance with Section 12 (1) (*b*) of the Act, among the companies participating in the £24,500,000. A score or more claims were received by the Railways Amalgamation Tribunal from "worked" companies under this head, of which the most important was that of the East London Railway Company, and for some time it seemed possible that these claims would be opposed by the Railway Companies' Association on behalf of the "residuary legatees." After considerable negotiation, however, a scheme has been agreed upon between the claimants and the "residuary" companies, and submitted to the Amalgamation Tribunal at a sitting held on Monday, July 17. This scheme provides for the payment to the various companies concerned of the amounts named in the schedule, and for the distribution of the remainder, together with the interest, among the working companies in accordance with a scheme to be submitted later.

The railways affected are the following:—Brechin and Edzell; Cathcart District; Charnwood Forest; Didcot, Newbury and Southampton; East London; Forth Bridge; Harborne; Horncastle; Kilsyth and Bonnybridge; Lampeter, Aberayron and New Quay Light; Lanarkshire and Ayrshire; Lauder Light; Mansfield; Mawddwy; Mold and Denbigh; Newburgh and North Fife; North Lindsey; Shropshire; Teign Valley; Vale of Glamorgan; Welshpool and Llanfair, and Yorkshire Dales. The total amount thus allocated is £375,000.

An "Eastern Group" Experiment.

A NOTEWORTHY experiment was made by two of the companies which go to form this group—the North British and Great North of Scotland—during the Edinburgh Fair holidays, which took the form of a special express service from Edinburgh to the favourite holiday districts of Speyside and Morayshire. The train, which ran on June 30 and July 1, was a seven-coach corridor luncheon car express of North British stock, leaving Edinburgh (Waverley) at 9.55 a.m., and only stopping thence at Dundee (11.14–11.19 a.m.), to Aberdeen, which was reached in 2 min. over three hours. Here two G.N.S.R. 4-4-0 engines took charge, and ran the express without a stop over the steeply-graded 53¼ miles to passing Keith in 66 min., and completed the 68 miles to the first stop at Craigellachie in 92 min., including the slow running over the single line beyond Keith. Fifty miles and a-half from Dyce to Auchindachy were run in the even hour. At Craigellachie the train divided, one portion running through up the Spey Valley to Boat of Garten, reached at 3.40 p.m., and calling *en route* at Aberlour, Ballindalloch, Grantown and Nethybridge, while the other ran forward to Elgin, reached at 3.5 p.m., and Lossiemouth, 3.24 p.m. Needless to say, such times were very far below those obtaining in ordinary service—in fact, the times achieved were 78 min. less than those of the best ordinary train to Lossiemouth, and 83 min. less than the best to Boat of Garten. The special service was repeated on July 30 and on August 1, with marked success.

Perpetuating an Honoured Name.

A COVENTRY reader, Mr. W. E. Briggs, has chosen a novel method of honouring the memory of the late Mr. Charles Rous-Marten, who, in September, 1901, initiated the popular "British Locomotive Practice and Performance" articles in these columns, and continued them in his characteristic style and with singular success until his untimely death in May, 1908. The widespread interest which Mr. Rous-Marten thus attracted to the subject of locomotive performance is perhaps his most enduring monument; any popularity achieved by

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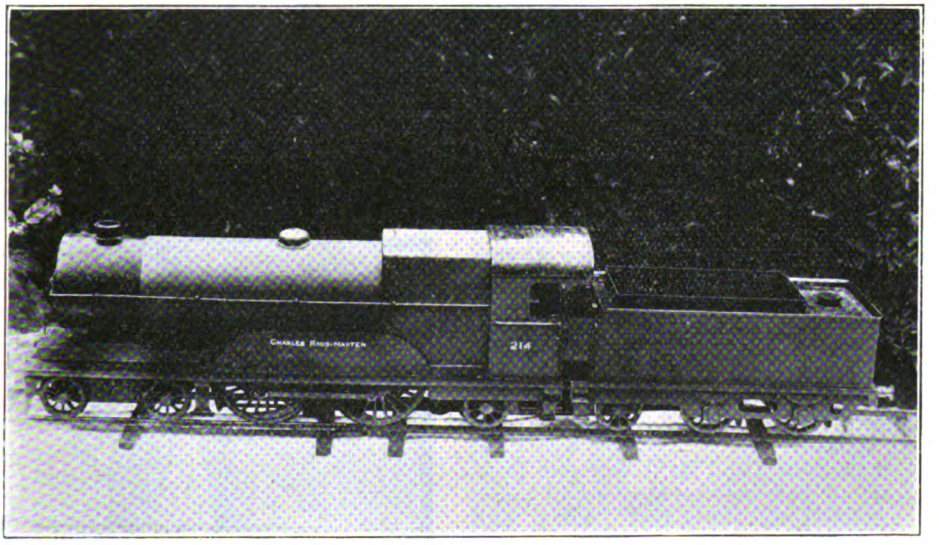
subsequent writers of this series of articles has certainly been erected in large measure on the solid foundation thus laid by their originator. Mr. Briggs has chosen as his method of commemorating the name of Mr. Rous-Marten the application of it to his fine 2½-in. gauge model "Atlantic" express engine, illustrated on this page. The model has an internally-fired water-tube boiler, cylinders are ⅝-in. bore by 1-in. stroke, with valves on top actuated by Joy's valve gear, and are arranged inside the frames; driving wheels are 3 5/16 in. diameter. A pull-out pattern regulator is fitted, and reversing is effected by means of wheel and screw. Both engine and tender wheels are fully braked. A novel feature of the engine is the articulation of the trailing engine and leading tender wheels, somewhat after the Gresley system. In regard to performance, the engine, working at 80 lb. per sq. in. pressure, finds no difficulty in hauling its owner, who rides in a specially-constructed ball-bearing trolley—no mean feat for a miniature locomotive running on so small a gauge as 2½ in. Externally the design is of "free-lance" type, and has a particularly massive appearance. Mr. Briggs puts forward the suggestion, which we heartily support, that the memory of Mr. Rous-Marten is worthy of a more enduring and a more public tribute than this, and asks whether the name which was so familiar to all the leading railway officers in his day—and to the majority of them to-day—as the most expert and careful observer and publicist in regard to locomotive performance that has ever lived—might not be perpetuated by being carried on a full-size locomotive. He mentions particularly in this connection the London & North Western Railway, of whose engines Mr. Rous-Marten wrote so frequently, and who are well-known for their catholicity of choice in the matter of engine names. With all diffidence we would commend the suggestion to the authorities at Crewe.



A MODEL LOCOMOTIVE THAT PERPETUATES AN HONOURED NAME.

Metropolitan Railwaymen at Play.

THAT railroading as a profession, or as a means of earning a living, does not preclude those who follow it from gaining distinction in the world of sport is amply proved by the excellent contests that take place around London throughout the summer season. Last month reference was made to the successful gathering that was held on St. Swithin's Day by the Metropolitan Railway Athletic Association at their Wembley Park Athletic Ground, but lack of space prevented us giving a full report. Like the Metropolitan Railway trains, the 27 events started promptly to time, and everything was excellently arranged and managed. The sports were highly entertaining. Mr. H. N. Deeley gained much commendation by winning the final in the 100 yards open handicap, from 2½ yards in 10⅕ seconds, and Mr. A. Rose-Taylor added to previous years' laurels by his victory in the 1-mile London Railways A.A. Championship. In addition to Sir G. Clarendon Hyde, Deputy-Chairman, Metropolitan Railway, Mr. J. W. Wheeler-Bennett, C.B.E.,

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METROPOLITAN RAILWAY SPORTS.
Sir Clarendon Hyde distributing the Prizes to the successful Competitors.

Director, and Mr. R. H. Selbie, C.B.E., General Manager and Director, all the leading officers of the company were present. The sports officials included Mr. R. H. Selbie and Mr. W. Holt as referees, and the judges were Messrs. Anderson, Ballingall, W. H. Brown, S. W. Corns, Charles Jones, J. B. Pritchard, H. S. Stewart, J. S. Anderson, E. Sutton, R. O. Taylor, John Wardle, and E. A. Wilson. Mr. F. Dawson was chief clerk of the course and Mr. J. Garland, Press steward. A very fine programme of music was rendered by the Great Central and Metropolitan Silver Prize Band, under the conductorship of Mr. William Smith. At the conclusion of the sports meeting the prizes were distributed by Sir G. Clarendon Hyde. In the evening dancing on the greensward was greatly enjoyed by a very large number of visitors. The Metropolitan Railway staff are fortunate in possessing such a fine athletic ground, covering as it does about 13 acres, and conveniently situated alongside the line. The land was given by the company, and the appreciation of the gift by the staff is shown by the use they are making of it. Lately the employees have purchased and erected on the ground, by means of subscriptions among themselves, a very fine pavilion, which may be used for concerts and other purposes during the winter season.

New Through Service, Brighton and the West.

REFERENCES were made in the August RAILWAY MAGAZINE to the new service between Brighton and the West. The Cardiff service is routed via Bristol, Bath and Westbury to Salisbury, where the through coaches from Ilfracombe and Exeter (Queen Street) are attached. The through train travels from Salisbury via Romsey and Eastleigh to Portsmouth, where the through carriages from Bournemouth are attached for the journey thence to Brighton via Chichester and Worthing. These new services link up, without change of carriage, South Wales, the West of England and the South Coast.

On the invitation of the Great Western, London & South Western, and London, Brighton & South Coast Railways, a number of Press representatives recently travelled by the through service to Brighton. The train, on arrival at Brighton, consisted of two London, Brighton & South Coast vehicles, which had come from Bournemouth, two London & South Western Railway vehicles from Ilfracombe, and four Great Western vehicles, including luncheon car, from Cardiff. At Brighton, where the train arrived exactly to time, the party were

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LONDON, BRIGHTON & SOUTH COAST RAILWAY "PRINCE REGENT" POSTER.

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received by the Mayor, Alderman E. J. Pankhurst, J.P., and the Mayoress.

Representatives of the railways present were :—Great Western Railway, Mr. S. A. Pope, Commercial Assistant to the Superintendent of the Line ; Mr. Frank Crabtree, Publicity Department ; and Mr. W. Herne. Trains Department. London & South Western Railway : Mr. F. V. Milton, Publicity Manager. London, Brighton & South Coast Railway ; Mr. G. H. Dennis, Publicity Superintendent.

The Mayor of Brighton presided at a dinner given at the Royal Pavilion. With the toast of "The Railway Companies" he coupled the names of Mr. Pope, Mr. Dennis and Mr. Milton, and said he wished to congratulate them on putting in force a service of trains to reach the Queen of Watering Places from the west, much quicker than could be done via London, with the additional advantage of no change of carriage, and he hoped it would be to the advantage not only of Brighton, but of all the towns served on the route. The inhabitants of Brighton were satisfied with the splendid service given them by the Brighton Railway, but they fully recognised the advantages of the new venture.

World's Greatest Passenger Traffic.

UNDER the above heading and over the signature of Sir H. W. Thornton, K.B.E., General Manager and Engineer-in-Chief, Great Eastern Railway, there has appeared in the *New York Times* the following letter, which speaks for itself :—"I notice in your issue of June 4, 1922, some figures relating to passenger traffic handled on American railways, with particular reference to passengers passing through Flatbush Avenue Station in Brooklyn. The volume of business handled by the Long Island Railroad reflects much credit upon its management, which has earned the admiration of the railway industry. However, although the Long Island handles 32,803,995 passengers in Flatbush Avenue, which leads you to suspect that these figures represent perhaps the largest passenger business in any station in the world, I would humbly direct attention to the fact that the Great Eastern Railway, at its Liverpool Street Station (London), handles annually 76,136,823 passengers."

Unusual Rolling-Stock Combinations.

IN years gone by we have, on several occasions, referred to instances of locomotives of more than one company hauling the same train, and with interesting combinations of rolling-stock. Three letters recently received revive this topic, and as it is one which appeals to many readers we may deal with them individually. Major A. R. Munro writes from Edinburgh, mentioning that on the Dundee and Arbroath Joint Railway a goods train from Arbroath to Dundee was headed by two tank engines, one North British and the other Caledonian, both being in steam, although the train was a light one. As this was on a joint line the explanation was, no doubt, that the North British engine, having to return to Dundee light, was coupled up in front of the Caledonian train for convenience of traffic. Major Munro suggests that the fact that the railways concerned are to go in different groups adds to the interest of the combination, but seeing that the section concerned is a joint line there is nothing specially remarkable, and no doubt, whatever changes may be made in some cases, there will still remain numerous instances of lines jointly owned by two groups, as in the case of the present separate railways, with corresponding traffic possibilities. Incidentally, Major Munro mentions that he noticed one of the old Caledonian 0-4-2 outside cylinder engines shunting in the yard at Arbroath, a type now rapidly dying out, though a few of these engines still remain.

Further Observations.

MR. S. WALLACE refers to an unusual train he noticed at the Midland station at Leicester. It consisted of a London and North Western 2-4-2 tank engine hauling a train of old North London coaches painted in the standard London and North Western Railway colours. He also observed a Great Eastern Railway horse-box train pulled by one of that company's rebuilt 4-4-0 engines, No. 704. The same correspondent mentions that at Vauxhall, London and South Western Railway, he noticed a London and North Western Railway 2-4-0 engine, No. 857, *Prince Leopold*, running through the station light, having worked a special London and North Western Railway train into Waterloo. Mr. Wallace comments that this is the only foreign engine he has ever seen on the London and South Western Railway near Waterloo and east of Vauxhall. It is certainly very unusual, and we cannot call to mind ever having seen an instance on that particular section.

A Leicester reader sends particulars of what he describes as "a railway mix-up," which is of interest in combination with the letter previously referred to, though in that case our correspondent is a Londoner, notwithstanding that he refers to railway curiosities seen at Leicester. Mr. Sydney W. A. Newton writes that on Sunday, April 30, a train left Leicester (Midland) station, going south, consisting of a London and North Western Railway 2-4-2 tank engine and two large corridor carriages of main line type, a passenger

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luggage van, and a bogie open wagon, all of Great Northern stock. The open wagon appeared to contain theatrical scenery. No doubt, this was a theatrical special which had reached the Midland system from the Great Northern Railway and was proceeding thence to the London and North Western Railway. Trains of this class can often be seen in the provinces on Sundays, though in any one district they may be somewhat rare.

"Pacific" Locomotives.

MR. ARTHUR CURRAN, of Newton Center, Mass., U.S.A., writes as follows: "The very handsome illustration of G.N.R. 4-6-2 engine No. 1470, which appears in the May number of the RAILWAY MAGAZINE, calls to mind the fact that the 'Pacific' type originated in the United States some 20 years ago, and has since become the standard express engine of America. Among the railways upon which this type gained favour in the early years of the present century, the Baltimore and Ohio is worthy of more than passing notice. The first Pacific engines on this historic line were built in 1906 at Schenectady Works of the American Locomotive Company. There were 35 of them, with dimensions as follow: Cylinders, 22 in. by 28 in.; coupled wheels, 6 ft. 2 in. diameter; bogie wheels, 3 ft. 1 in. diameter; trailing wheels, 4 ft. 2 in. diameter; boiler, 72 in. diameter; heating surface, 3,418 sq. ft.; grate area, 56·5 sq. ft.; total weight of engine, 229,500 lbs. Tender mounted on bogies, with wheels 3 ft. 1 in. diameter, and having a capacity for 7,000 (American) gallons, and 12 (American) tons of coal. Tractive power, 31,100 lb.; horse-power, 1,614. Height of chimney above rail, 14 ft. 7 in.; width, 10 ft. 1 in.; length over all, 74 ft. 2 in. A nice little engine! The enclosed photograph [not reproduced] shows one of these Pacific engines on one of the 'Royal Blue Line' expresses, which provide excellent services between New York and Washington. It will be observed that the train consists of but four cars; but it must be kept in mind that these 'Pacific' engines were designed to 'take their turn' in any of the services which the exigencies of traffic might require; and that these included the easy 'Royal Blue' trains as well as the heavy Western trains for Chicago, etc. This method is similar to that employed upon the larger British railways, which do not trouble themselves merely because working conditions frequently require the use of a big engine on a rather light train. Since the original 35 were placed in service, the Baltimore and Ohio have had three additional classes of 'Pacific' engines put upon the line, and the trains are quite heavy enough to give them work to do.

"In view of the foregoing, one may be pardoned the expression of some amazement that England is represented by but two examples of the Pacific type. No doubt the *Great Bear* and *Great Northern* will have plenty of companions before long, however, as British engineers come to a realisation of the immense advantages of this wheel arrangement, affording, as it does, the opportunity to provide a boiler of adequate size, with generous grate area. Mr. Allen has, upon more than one occasion, referred with some surprise to performances of 4-4-0 engines, which were little, if at all, inferior to those of 4-6-0 locomotives. The truth is, of course, that the 4-6-0 really does not afford opportunity for a more satisfactory form of grate than the 4-4-0 does; consequently, the 'steaming capacity' of the 4-6-0 does not bear a proper relation to its greater weight, and cannot be made to, either! The romance of the railway revolves around the older types of locomotives; but even the most obstinate of the old-time enthusiasts must see that, after all, the modern wheel arrangements are best adapted to the conditions of the present day. I can speak with some feeling in regard to this matter, for I have a vivid recollection of some of the most famous locomotives in America, and a fair acquaintance with the design and achievements of others in Britain. Freak machines may be dismissed with contempt, but designs of proven worth will help, very effectively, in the solution of Britain's transport problems."

Petrol Rail Motor 'Bus, North Eastern Railway.

FOR some time past North Eastern Railway officers have realised that on certain portions of their railway there was room for a service conducted on lines as nearly as possible identical with those of motor 'buses on the roads. With the view of ascertaining, without much initial expenditure, whether the scheme is likely to prove financially successful, they have converted one of their "Leyland" road motor 'buses, formerly running on the road services in the vicinity of Durham, so as to make it suitable for running on the railway. By the courtesy of Mr. R. L. Wedgwood, General Manager, we are able to reproduce a photograph of the rail motor 'bus in service.

The enormous increase in railway working expenses, due to various causes arising out of war conditions, has made it impossible to provide on some of the country branches, where the number of people travelling is small, a train unit sufficiently cheap to cover its working expenses out of the small revenue available, and it has become necessary to

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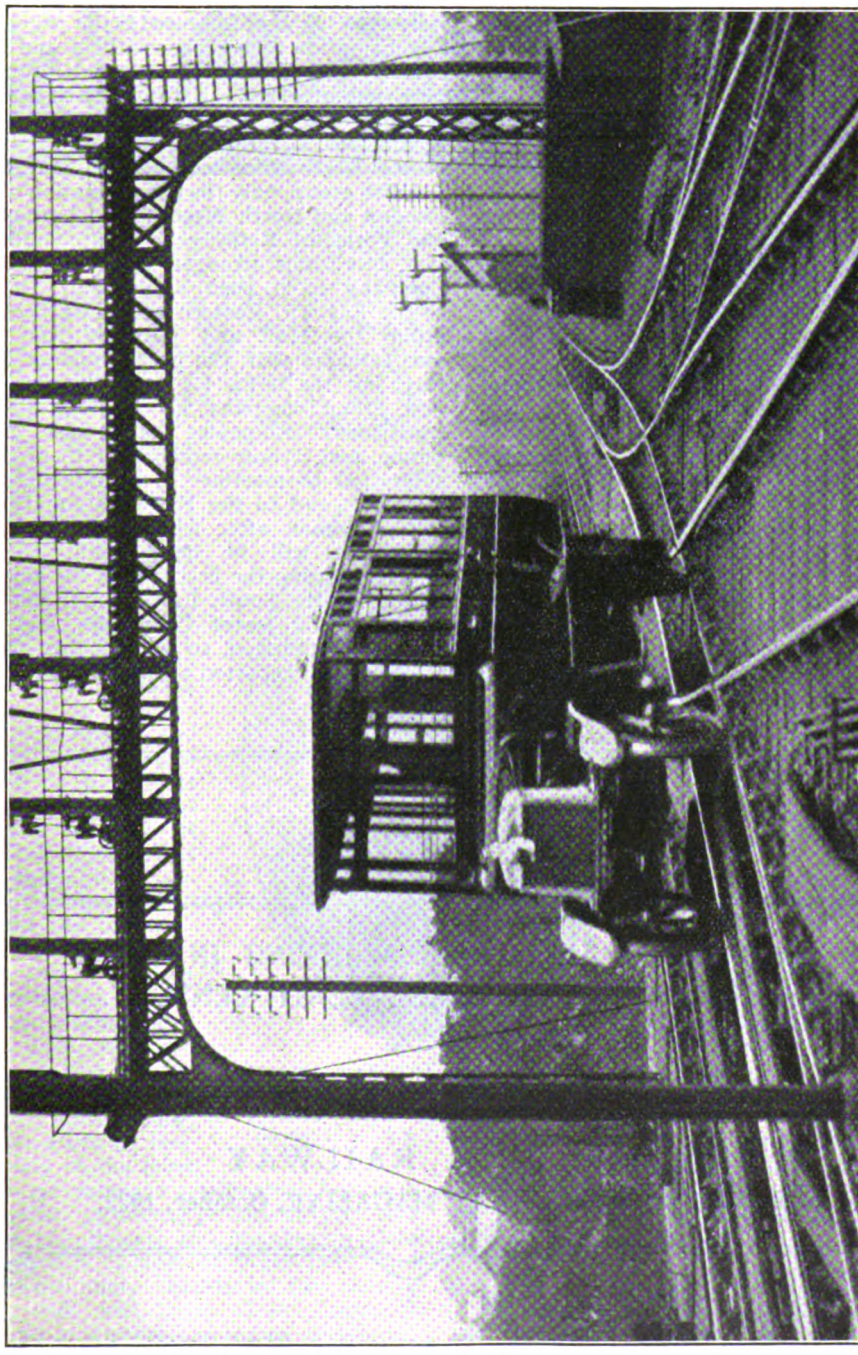

PETROL RAIL MOTOR 'BUS, NORTH EASTERN RAILWAY.

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devise a cheaper train unit than the ordinary one with a steam engine and one or more ordinary railway carriages. It has been felt that by adopting the petrol engine, a train unit sufficiently cheap to meet the existing conditions can be devised, and the petrol rail motor 'bus which the North Eastern Railway Company put into traffic on Wednesday, July 19, is a first step in the investigation of this problem. The vehicle in question is not considered by the company's officers as anything like the last word, and it is only possible to make experiments on a very small scale. If, however, the results of the working of this vehicle are encouraging, the company intend to build vehicles of a special design, carrying up to 40 passengers, and maintaining an average speed of approximately 30 m.p.h.

This 'bus is running between Copmanthorpe, York, Strensall and Earswick, and is manned by a motorman and a conductor exactly in the same way as if it were running on the highway. Single journey tickets are issued on board, so that passengers have not the trouble of going to the booking office. It has accommodation for 26 passengers. It can be driven from both ends, and run in either direction, and the motive power consists of a 35-h.p. Leyland engine of the standard type, supplied by the builders for their ordinary commercial road vehicles.

Railway Grouping Progress.

DEFINITE progress is now being made towards the realisation of the Railway Act, 1921, in regard to the grouping of the home railways. As already stated in our pages, the amalgamation of both constituent and subsidiary companies in the Western group is now well advanced, all the constituent and a large proportion of the subsidiary companies having been already dealt with. In the case of the North Western, Midland and West Scottish group, only the amalgamation of the London and North Western and Lancashire and Yorkshire Railways is an accomplished fact, but terms arranged with the Midland Company have been announced. In the North Eastern, Eastern and East Scottish group the Hull and Barnsley has been amalgamated with the North Eastern Railway, but the terms for the formation of a new group company as affecting all the constituent companies have been made public, and it only remains for them to be submitted to meetings of shareholders for approval, and to the Railways Amalgamation Tribunal, after which the subsidiary companies will be dealt with. In the Southern group the first step is the amalgamation of the South Eastern and London, Chatham and Dover Companies, and this has been approved, so that further procedure may be expected at an early date.

LOCOMOTIVE AND TRAIN WORKING IN THE LATTER PART OF THE NINETEENTH CENTURY.

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Under this heading Mr. E. L. Ahrons will deal with the Locomotives and Trains of the

TAFF VALE RAILWAY

in the forthcoming RAILWAY MAGAZINE, October, 1922.

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MR. HERBERT RHYS PRICE, has retired after 47 years' railway service, from the General Managership of the Brecon and Merthyr Railway, consequent on the absorption of that undertaking by the Great Western Railway. Mr. Price joined the Brecon and Merthyr Railway service as a clerk in 1875. Subsequently he became Registrar, and in 1889, at the age of 28, was appointed Secretary, the office of the department being in London. In 1903 he was made General Manager, and moved to Newport, and continued to fill the dual office of General Manager and Secretary until 1916, when Mr. W. W. Heard took over the duties of Secretary. In some respects the Brecon and Merthyr Tydfil Junction Railway, to give it its full title, was one of the most notable of the local Welsh and Monmouthshire railways. Incorporated in 1859, for the construction of railways between Brecon and Merthyr, it soon extended southwards and reached Newport. The southern section of the system is a coal-carrying line, whilst the northern section from Pant to Brecon is one of the most picturesque railways imaginable, but with little traffic. Running power arrangements brought the Brecon and Merthyr in close touch with a number of other lines, and Mr. Price's many friends in the railway world, will join with THE RAILWAY MAGAZINE in wishing him a long and happy retirement

MR. HERBERT RHYS PRICE,

General Manager,

Brecon & Merthyr Railway, 1903–1922.

* * *

WITH regret we record the death of Colonel Druitt, who was one of the inspecting officers of the Railway Department of the Board of Trade from September, 1900, to February, 1919. Colonel Druitt joined the Railway Department in September, 1900, was promoted to Colonel in 1904, and retired on February 4, 1919. His first accident inquiry related to the collision, on October 20, 1900, at Balfron, on the North British Railway, and among the serious cases he inquired into were the Quintinshill of May 22, 1915, Weedon on August 14, 1915, and Wigan of December 19, 1916.

* * *

COLONEL F. R. COLLINS, the Advisory Engineer of the Union of South Africa Railways to the High Commissioner in London, has relinquished that post and is returning to South Africa to take up the appointment of Chief Mechanical Engineer, in succession to Mr. D. Hendrie. Mr. G. C. Elliott, Assistant to the Chief Mechanical Engineer, has succeeded Mr. Collins as Advisory Engineer in London. Meantime, in the absence of Mr. Hendrie on special duties oversea, and until Colonel Collins assumes control in South Africa, Mr. G. T. Wheatley, Mechanical Engineer, Salt River, is acting as Chief Mechanical Engineer.

* * *

AT the inquiry held by Major Hall, into the buffer-stop collision of July 27, at Liverpool Street station, Great Eastern Railway, the driver of the train concerned said that when about half way along the platform he thought he was going to stop

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COL. F. R. COLLINS,

Chief Mechanical Engineer,
South African Railways.

"short," he therefore released the brake but re-applied it too late.

* * *

On Saturday, July 29, Mr. R. H. Selbie, C.B.E., General Manager and Director, Metropolitan Railway, formally opened the Remembrance Hall erected on a specially reserved portion of the company's sports ground at Wembley Park. This hall is intended for use for concerts, meetings, &c., during the autumn and winter months, and presents a handsome appearance. The building was purchased from the Disposals Board, and was previously in use at Summerdown Camp, Eastbourne. It comprises a main hall, 146 ft. by 38 ft. by 15 ft., auditorium, 112 ft. by 36 ft., orchestra well, stage, kinematograph chamber, &c.

* * *

Deciding the awards for the best of the gardens on the Metropolitan District Railway proved more difficult this year than usual and no fewer than two first prizes, three second prizes, and seven third prizes had to be made. In making the awards consideration was given to the difficulties associated with the position of the garden, the size of the work undertaken, the scheme of arrangement and neatness, and the choice of position. Station inspectors on the District line, which runs trains every few minutes throughout the day, do not have much time to devote to the work and the results are therefore all the more creditable. First prizes were given in respect of Northfields and Boston Manor stations; two second prizes to Walham Green and one at Ealing Common; third prizes to Cromwell Curve, Lillie Bridge Yard, Chiswick Park, Hounslow Barracks, South Kensington, Acton Town and South Ealing. In addition, fourteen fourth prizes were awarded at different places.

* * *

In connection with the opening of the grouse-shooting season the Great Northern Railway arranged for the service of trains on the East Coast route to Scotland to be augmented as necessary to meet the heavy demand for accommodation. Throughout the season intending passengers are advised to make early application to the Stationmaster at King's Cross station for sleeping berths, seats or compartments to be reserved. Sleeping car trains leave King's Cross, weekdays and Sundays, at 7.30 p.m. (Saturdays excepted) for Aberdeen, Perth, Inverness, Glasgow and Fort William, 10.20 p.m. for Glasgow, Dundee and Perth and 10.30 p.m. for Edinburgh. For the convenience of passengers travelling by the 7.30 p.m. ex King's Cross dinner is served on leaving London, Sundays excepted. For those preferring to travel by daylight, luncheon car expresses leave King's Cross at 9.50 a.m. for Edinburgh, 10.0 a.m. for Glasgow, Perth and Aberdeen, 11.20 a.m. for Edinburgh and Glasgow, and 1.20 p.m. for Edinburgh. Such passengers will find the publication entitled "On Either Side" which depicts places of note to be seen from the train, most helpful in making the journey interesting. Copies can be obtained free at any G.N.R. office or from the Superintendent of the Line, King's Cross Station.

* * *

A report issued recently of the proceedings of the Ministry of Transport and the Light Railway Commissioners under the Light Railways Acts, states that the powers of the Light Railway Commissioners were transferred to the Ministry as from August 19, 1921. The Commissioners remained in office for six months after that date to deal with applications then before them, and ceased to hold office on February 19, 1922. During the year the Minister confirmed the following Orders made by the Light Railway Commissioners, after making such amendments as were deemed necessary: Llantrisant; Cambrian Railways (Tanat Valley Light Railway Transfer); London and North Western Railway (Wolverhampton and Cannock Chase Light Rail-

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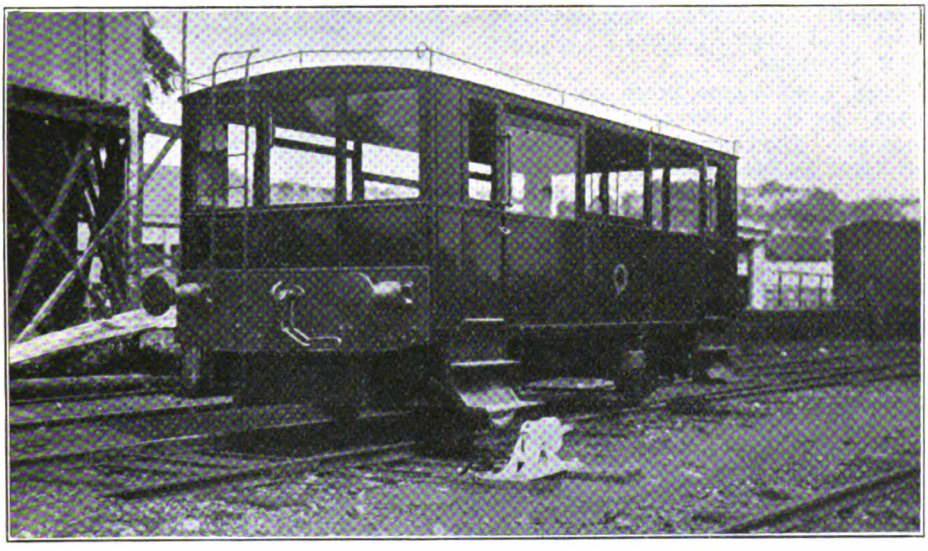
way); Dearne District; Lee-on-the-Solent; Totton Hythe and Fawley. Three applications for Orders were made to the Ministry in November, 1921: (1) Ashover Light Railway (Extension); (2) County of Gloucester (Gloucester and Brockworth) Light Railway; (3) Doncaster Corporation Light Railways (Extension).

* * *

On this page is illustrated a rail motor car constructed by the Drewry Car Company, Limited, to the instructions of Lieut.-Col. H. F. Stephens, Engineer and General Manager of the Weston, Clevedon and Portishead Light Railway. As Railway Magazine readers are aware this line is 14½ miles in length and of normal 4 ft. 8½ in. gauge. The car is run by a 4-cylinder petrol engine 25/35 b.h.p. and its oil consumption, on easy gradients, is 16 miles to the gallon. In length it is 19 ft. overall; in height, 8 ft. 3 in. from rails to roof, and its extreme width is 8 ft. It is driven (chain drive) from either end and is fitted with hand brakes at each end. The wheels are of 2 ft. diameter. As will be seen by the illustration it is fitted with windows at both ends as well as sides; all the side windows will open for ventilating purposes. The panels below the windows are of steel. In after-dark travel acetylene lighting is used. The car conveys 42 passengers—30 sitting and 12 standing. The car is provided with rails round the roof to enable light luggage and market produce to be carried outside, thus giving the passengers more accommodation and preventing the inconvenience that attends travel in a car blocked with luggage or merchandise. Lieut.-Col. Stephens is to be congratulated on this latest acquisition of the Weston line.

* * *

A concession affording both a reduction in travel cost and an added convenience has been revived by the Metropolitan Railway for the benefit of rural ramblers. Pedestrian tour tickets are issued at "Metro" stations in London to various points available for return from alternative stations. Thirty-four of these tours have been arranged affording ample scope for enthusiastic ramblers.



WESTON, CLEVEDON AND PORTISHEAD LIGHT RAILWAY RAIL MOTOR CAR.

Passenger trains on the Ravenglass and Eskdale (15-in. gauge) Railway are now being fitted with continuous brakes, of the simple vacuum type, the first train equipped being tested on July 16. The brake is quite the smallest vacuum apparatus in existence. The locomotive is fitted with a combination air valve and ejector which gives 21 in. of vacuum with 120 lb. of steam and the four-wheeled coaches have each a 10 in. diameter vacuum sack operating through compensating rigging on all wheels. The brake is much favoured by the drivers, as it gives them more confidence in handling trains over the steep (1 in 40 and 1 in 60) grades with which this railway abounds. On the day mentioned over 40 Midland enginemen from Lancaster depôt, accompanied by Mr. McCallum their district locomotive superintendent, spent a

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"busman's holiday" on the line. They were astounded at the work the 4-6-2 type "model" engines performed.

* * *

IN intimate connection with the Eskdale line, above mentioned, a granite and sett-making quarry (Beckford Granite Quarries, Limited) has just been opened. Siding extensions are in course of construction as well as alterations to Ravenglass station to allow the minerals to be transferred to Furness Railway trucks with the least delay and expense.

* * *

DURING the coming session, 1922–23, a number of railway papers will be read at the ordinary meetings of the Institute of Transport. The list includes the following:

November 6.—"British Railway Operating Statistics and their Lessons," by SIR WILLIAM ACWORTH.

February 5.—"Wagon Stock on British Railways," by H. N. GRESLEY.

March 5.—"The Operation of a Railway-Owned Port," by MAJOR G. S. SZLUMPER.

April 6.—"The Influence of Transhipment on Railborne and Road Traffic with special reference to the most economical Methods of Labour-Saving Appliances," by C. BENTHAM.

"Labour-saving Appliances (Operating)," by J. ROSTERN.

May 7.—Investigation of the return on Capital Expenditure resulting from Electrification," by SIR PHILIP DAWSON, M.P.

Among the lectures to be delivered to graduates and students during the same session are:—

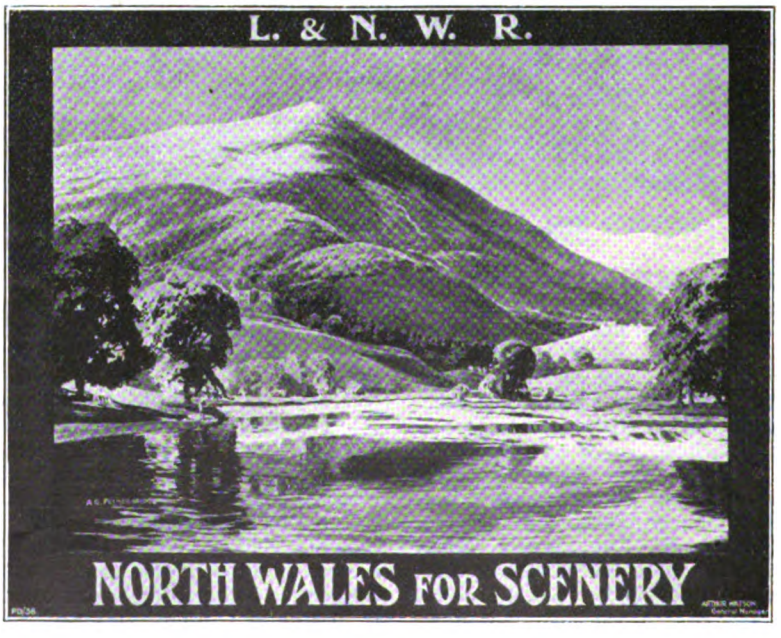
October 17.—"The Effect on Traffic Working Arrangements and Working Costs of Daily and Seasonal or Periodic Variation in Passenger Loads and Unbalanced Traffic Movements," by C. J. SELWAY.

February 13.—"Modernisation of Passenger Railway Stations," by F. BUSHROD and J. F. S. TYLER.

* * *

AN Ayrshire correspondent writes, concerning the working of the Glasgow and South Western Railway new 4-6-4 tank engines, as follows:—

No. 540.—Stationed Ayr. On 8.25 a.m. and 5.10 p.m. non-stop to and from Glasgow; Drivers, J. Hastings and J. Young. Nos. 541 and 542.—Stationed Ayr. Work on other fast trains, including 12.30 p.m. ex St. Enoch. No. 543.—Stationed Corkerhill. Works 4.10 p.m. express to Girvan and returns on 7.20 semi-fast. No. 544.—Stationed Fairlie Pier. Works to Glasgow. No. 545.—Stationed Hurlford. Works



THE LATEST LONDON & NORTH WESTERN RAILWAY POSTER.

Enclosed in a green border, the original picture is a fine specimen of colour printing. The poster measures 4-ft. $0\frac{3}{4}$-in. by 3-ft. $2\frac{1}{2}$-in.

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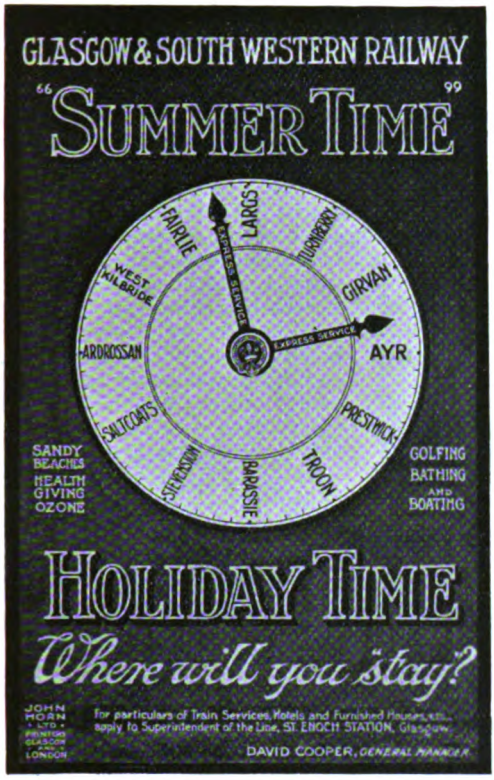


A "SIGN OF THE TIMES' POSTER.

London express to and from St. Enoch via Barrhead. The 5.10 p.m. express was run from Glasgow to Ayr in 43 minutes on a recent night. Load 304 tons net. No. 540. These 4-6-4 tank engines are classed "O" in the load lists.

* * *

Respecting other Scottish locomotives, the same correspondent writes: The following 4-4-0 engines of Mr. Smellie's 6-ft. class have been reconstructed with new boilers, &c., Nos. 467, 468, 701, 702, 703, 704, 706, 711, 713, 714, 716, 719. The ancient 0-4-4 tank which worked the Beith branch and belonged to the Joint Line, has now disappeared, and No. 728, a Stirling 0-4-4 tank (old No. 1A) is in its place.

* * *

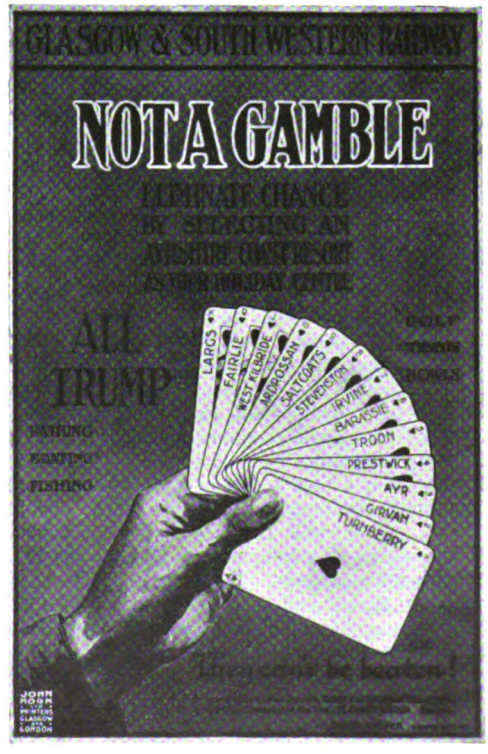
A VALUED RAILWAY MAGAZINE correspondent writes that at 3.8 p.m. a train arrives at Oxford hauled by a London and South Western engine and goes out again at 3.15 p.m. behind a Great Central locomotive. This he remarks, is "the through from Bournemouth 11.30 a.m. to Newcastle-on-Tyne; it is given 5 minutes at Banbury, but nothing particular happens there as Oxford is the 'frontier' point by this train. The transfer from London and South Western to Great Central seems to me noteworthy."

* * *

A HULL reader reports: "Hull and Barnsley goods engines are being re-numbered as North Eastern stock. The new numbers are composed of the old ones with the addition of '3000.' These numbers are being painted on the tender with the letters 'N.E.' on either side."

* * *

WHEN the new station at Waterloo was opened in March last the King and Queen were to inspect the central archway, which was erected and decorated as a Memorial of the London and South Western men who fell in the war. The names of these men are inscribed on bronze tablets affixed to the walls of the arch. The King was indisposed on the day of the ceremony, and the Queen acted for him. Saturday afternoon, August 5, was the first occasion since then on which the King had been to Waterloo, and he expressed to Sir Herbert Walker, the General Manager, a desire to inspect the Memorial. Their Majesties left the Royal Special from Portsmouth, entered their cars, and, passing out by the Central roadway, drove round to the memorial arch, and with the Duke of



A WINNING POSTER.

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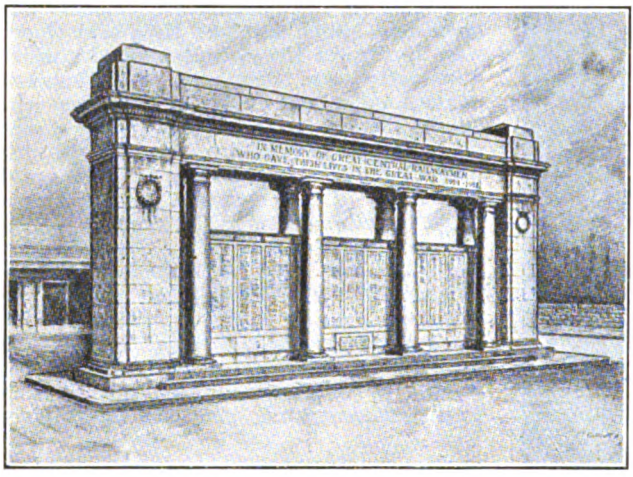
Connaught stopped opposite the Memorial, while Her Majesty pointed out its principal features.

* * *

On August 9, the war memorial, erected in the Courtyard of Victoria Station, Sheffield, "To the 1,304 Great Central Railwaymen who gave their lives in the Great War, 1914-1918," was unveiled by Field-Marshal the Rt. Hon. Earl Haig, K.T. Among those present, in addition to the Rt. Hon. Lord Faringdon, Chairman, and Sir Sam Fay, General Manager, were most of the directors and chief officers, together with nearly all chief departmental assistants, and district officers from all over the system. In the course of an appropriate speech, Lord Faringdon said they were particularly fortunate and proud to have the great General who led armies to victory with them, and they were grateful to him for coming to unveil the Memorial. Earl Haig made an eloquent speech, which he concluded by tendering his thanks to railwaymen and, that day especially, the men of the Great Central Railway, for the courage, the loyalty and the skill which he, as a former Commander of so many of them, had frequent occasion to appreciate and to value. How well they bore their share of the burden, the long roll of names on that Memorial testified. Those men were comrades of theirs and his. They fought for the same cause—to bring liberty to the oppressed and to preserve justice and fair dealing among men, to maintain the good name of their race, and the safety and the honour of their country. After the unveiling dedication prayers were offered by the Rev. Canon T. Houghton, M.A., Rural Dean of Sheffield and Vicar of Ecclesall The "Last Post" was then sounded, and "Wreaths of Remembrance" laid at the base of the Memorial by Mr. Walter B. Gair, Deputy Chairman, on behalf of the directors, and by Sir Sam Fay, General Manager, on behalf of the staff. The National Anthem and the Benediction closed the proceedings, after which wreaths and other tokens brought by those present were reverently placed before the Memorial. Very complete arrangements were made for the attendance of relatives and friends of those whose names appear on the Memorial, special trains being provided from London, Manchester and Cleethorpes, while some travelled by ordinary trains. The War Memorial engine *Valour* hauled the Manchester special, while the engine *Earl Haig* was used for the 10 a.m. ordinary train from London, to which was attached the directors' saloon, in which Earl Haig, with the Chairman, Directors and General Manager, travelled to Sheffield.



GREAT CENTRAL RAILWAY WAR MEMORIAL.

* * *

In connection with the reconstruction of the City and South London Railway and in substitution of the railway facilities a special service of motor 'buses is being run from Euston station (London and North Western Railway) via Drummond Street, Seymour Street, Pentonville Road, City Road, Finsbury Pavement and Moorgate Street station. These 'buses work in conjunction with a revised time table of trains and only stop at the closed Underground stations. In order to distinguish them from the standard red General 'buses operating on the above roads they are painted blue and cream and therefore are easily recognizable. They run on weekdays every three minutes during the rush hours and every five minutes during the rest of the day. On Sundays a five-minute service is maintained throughout the day.

* * *

Through bookings are in operation between the City and South London Railway (south of Moorgate) and auxiliary buses and *vice versa* from bus to rail. Season tickets are not available on the buses but they continue to operate on the railway between Clapham Common and Moorgate with the exception, of course, of Borough station which was closed on July 17 to facilitate the

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progress of the work of reconstruction. In addition to these arrangements for maintaining the service now provided by the City and South London Railway, it should be noted that passengers proceeding northwards from stations between Clapham Common and Moorgate, are able to reach Old Street by changing at Moorgate on to the Great Northern and City line.. Euston and King's Cross can also be reached by changing at Moorgate and proceeding via the Metropolitan Circle trains. For passengers travelling from Old Street southwards arrangements have been made for bookings via the Great Northern and City line changing at Moorgate Street.

South London Railway include the lengthening of the platforms, the rebuilding of the stations and the provision of escalators at such stations where these are practicable.

* * *

LONDON, Brighton and South Coast Railway locomotive No. 44 was built at Brighton Works in June 1902, Class B4, designed by Mr. R. J. Billinton, and then named *Cecil Rhodes*. The chief interest at the present time lies in the fact that lately it has been fitted with extended smoke-box and superheater, the only other engine of this class so fitted being No. 46, late *Prince of Wales*. Readers will note by the illustration

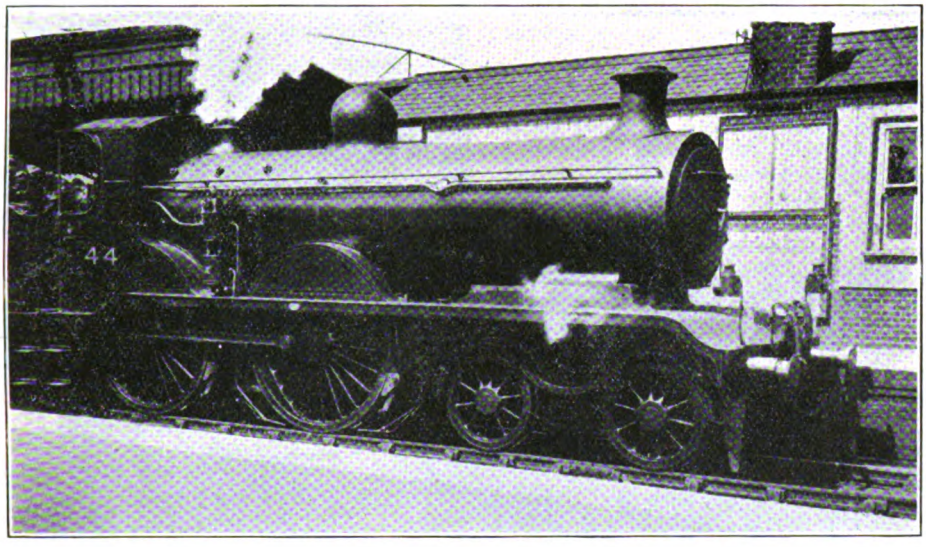

Photo.] **LONDON, BRIGHTON & SOUTH COAST RAILWAY.** [*O. J. Morris.*

4-4-0 Rebuilt Locomotive No. 44, equipped with Superheater.

CLOSING down the northern portion of the City and South London Railway on August 8 was the signal for the work of reconstruction to begin in real earnest. The work to be executed includes the widening of the present tunnels from a diameter of 10 ft. 6 in. to a diameter of 11 ft. 8¼ in. to permit of through trains of standard Underground pattern being run through eventually from Clapham Common to Edgware. The task of linking up the City and South London Railway at Euston with the Camden Town station of the Hampstead line and the extension of this line from Golders Green to Edgware are now in hand and it is hoped that the reconstructed line will be opened for traffic between Moorgate and Hendon on or about October 1, 1923. Other improvements to be carried out on the City and

on this page that the usual crest upon the splashers is missing, and the same applies to all London, Brighton and South Coast Railway engines as they are repainted. The *Prince of Wales* on being repainted this year lost its name, and now possesses the plain splasher as does No. 44.

* * *

FOR the use of English-speaking tourists, the Northern and Eastern Railway of France has produced an excellent guide book entitled, *Battlefields of France*. In addition to 74 pages of profusely illustrated descriptive reading matter, the book includes a map of the war front, showing in colours the line on September 5, 1914, and the line on November 11, 1918. Further, a list is given of the principal localities or battlefields

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mentioned in the text with designation of the nearest railway stations. RAILWAY MAGAZINE readers wishing for a copy should write to the Correspondent, Northern Railway of France, Victoria Station, South Eastern and Chatham Railway, S.W. 1. From the same source may be obtained a well-illustrated pamphlet, printed in French, entitled *Les Plages du Nord de la France*.

* * * *

DINING cars are being introduced this summer for the first time to the inhabitants of the "Far North" of these islands. From the beginning of June a Pullman Dining Car has been run through on the 10.10 a.m. from Glasgow (Buchanan Street) to Aviemore on the Highland Railway, returning thence on the 3.30 p.m. from Inverness. Since July 10, the Great North of Scotland Railway has followed suit with a restaurant car between Aberdeen and Inverness, running north on the 8.5 a.m. train (in connection with the Penzance-Aberdeen service), and returning as a luncheon and tea car on the 12.50 p.m. from Inverness. Between Elgin and Inverness, of course, the car runs over the metals of the Highland Railway. There is doubtless "Group" activity to be found behind these welcome developments.

IN the course of a letter to *The Times* in reference to some remarks by a correspondent on the subject of the Grand Trunk decision, Mr. W. J. Stevens says:—"To the various interesting examples of remarkable recovery in railways which appeared at one time to be absolutely hopeless, your correspondent might have added the recent striking example afforded by the District Railway. For about 40 years no dividend was paid on the ordinary stock, and in 1909 arrears of £244,000 had actually accumulated on the then existing £1,250,000 of 4 per cent. guaranteed stock, which were funded. Since 1909 the company has gradually earned the dividend, first on its 4 per cent. guaranteed stock, then on its 4½ per cent. first preference stock, then on its 4½ per cent. second preference stock, and now for the past half-year the District Railway has paid a dividend on its ordinary capital at the rate of 3 per cent. per annum."

Photo.] [*J. D. Thomson.*

LONDON & SOUTH WESTERN RAILWAY CHERTSEY BRANCH MOTOR TRAIN.

Train is not running on the right-hand road as it appears at the first glance, but on the left-hand road in the normal way. The engine is pushing and not hauling the train.

* * *

AT a general meeting of the members of the Railway Club at 65, Belgrave Road, S.W.1., on Friday evening, September 15, Mr. W. J. Sadler will address the gathering, his subject being "Twenty years progress in Signalling." On Saturday, September 23, a club visit is to be paid to the Westinghouse Brake Works, near King's Cross Station. The visit is timed for 2.45 p.m.

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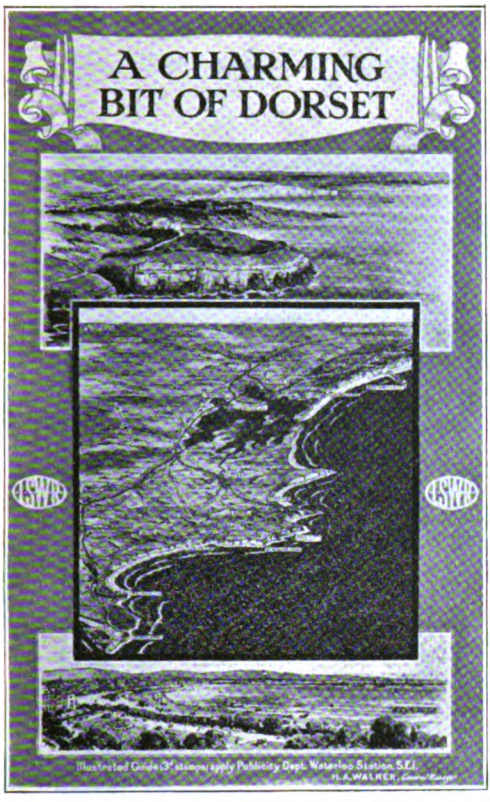

LONDON & SOUTH WESTERN RAILWAY.

Above is a half-tone representation of an East Dorset "District" poster. The original is a particularly attractive production, printed in colours.

ALTHOUGH not a special Great Eastern Railway number, the forthcoming October RAILWAY MAGAZINE will be one of a pronounced Great Eastern character. The leading article, which will be profusely illustrated, will describe the Hackney Downs lines. As subscribers to the RAILWAY YEAR BOOK are aware, it was in 1872 that the Great Eastern lines from Bethnal Green to Hackney Downs, Edmonton and Tottenham were completed, and the jubilee of the undertaking will be made the opportunity for a characterisitc contribution from the pen of Mr. J. F. Gairns. In passing, it may be remarked that the jubilee of the lines above mentioned coincides with the diamond jubilee of the change of title, in 1862, of the Eastern Counties Railway to the Great Eastern Railway. The further Great Eastern feature in the October issue will be Mr. Cecil J. Allen's monthly article, "British Locomotive Practice and Performance," which, on this occasion, will be devoted to the railway in question, particularly in regard to its famous Continental trains, but further embodying notable records of a footplate run from London to North Walsham on the Cromer service. Another valuable item in the October RAILWAY MAGAZINE will be "British Express Trains in the Summer of 1922," by "Voyageur." This contribution will include a careful analysis of the fastest and longest railway runs in Great Britain; restaurant and Pullman-car services; slip coaches, etc. Altogether the coming October MAGAZINE will be exceedingly attractive and in great demand. Readers who have not placed an order with a bookseller or railway bookstall manager to supply the periodical regularly, should do so now, in order to secure an October copy.

* * *

FROM London Electric Underground Railways comes a further series of leaflets of convenient pocket size, descriptive of the noteworthy places served by its lines and connections. These include two leaflets dealing with the sights of London (public buildings and entertainments), Windsor, Chislehurst, and four pleasing pamphlets, each containing details of rambles in Middlesex from Ickenham, Ruislip, South Harrow and Osterley. These leaflets are gratis, and a complete set will provide Londoners with a wonderful choice of charming spots in which to have a day's outing.

* * *

REFERRING to the illustration on page 121, August RAILWAY MAGAZINE, under the heading "An Unusual European Locomotive Type," Major F. C. Moore writes from Bath sending a print of a photograph of a 2-6-4 tender locomotive built by Messrs. Neilson & Co., for the South African Railways, hauling a local train at Kalk Bay, Cape Province. As he points out, this is an instance of the use of this type for British built locomotives, whereas, hitherto, we were only aware of the type as used for Continental locomotives, and then to a very limited extent.

* * *

THE London, Brighton and South Coast Railway announces that the electrification of its system to Purley and Coulsdon will be rapidly proceeded with and that it is anticipated that the work will be completed during 1922. When this section is electrified it is expected that the train service to Norbury, Thornton Heath, Selhurst, Croydon, Purley and Coulsdon will be more than doubled.

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RAILWAY SCENES IN SUNNY SPAIN.

TWO photographs sent by Mr. W. T. Ridgway, at present of Madrid, are reproduced above. The upper illustration shows a group of "Guardia civiles" (Civil Guards); two of these men, according to Spanish law, must accompany each train carrying passengers. Note the second and third-class rolling-stock, such as is in general use for local traffic and branch lines. This photograph was taken at Murcia-Alquerias, the locomotives and rolling-stock belonging to the "Andaluces" Railway Company, which connects with the Madrid, Zaragoza and Alicante Company at Murcia. The lower illustration depicts the railway station at Elche, Alicante. This town is noted for its palm trees which, as the photograph shows, even grow in the station itself. The locomotive on the left, engaged in mixed traffic, is quite a veteran, having been built by Messrs. Schneider & Co., Creusot (the famous French munition factory), in 1859. The other engine was built in Germany in 1883.

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THE RAILWAY MAGAZINE.

NEW FOUR-CYLINDER 4—6—0 EXPRESS LOCOMOTIVE, GREAT WESTERN RAILWAY.

Mr. C. B. COLLETT, O.B.E., M.Inst.C.E., Chief Mechanical Engineer.

Cylinders (4), 15 in. by 26 in. Coupled Wheels, 6 ft. 8½ in. diam. Bogie Wheels, 3 ft. 2 in. diam. Steam Pressure, 225 lbs. per sq. in.
Heating Surface: Tubes, 1,686·60 sq. ft.; Firebox, 154·78 sq. ft.; Superheater, 262·62 sq. ft.; Total, 2,104 sq. ft.
Grate Area, 27·07 sq. ft. Weight in Working Order: Engine, 75 tons 12 cwt.; Engine and Tender, 115 tons 12 cwt.

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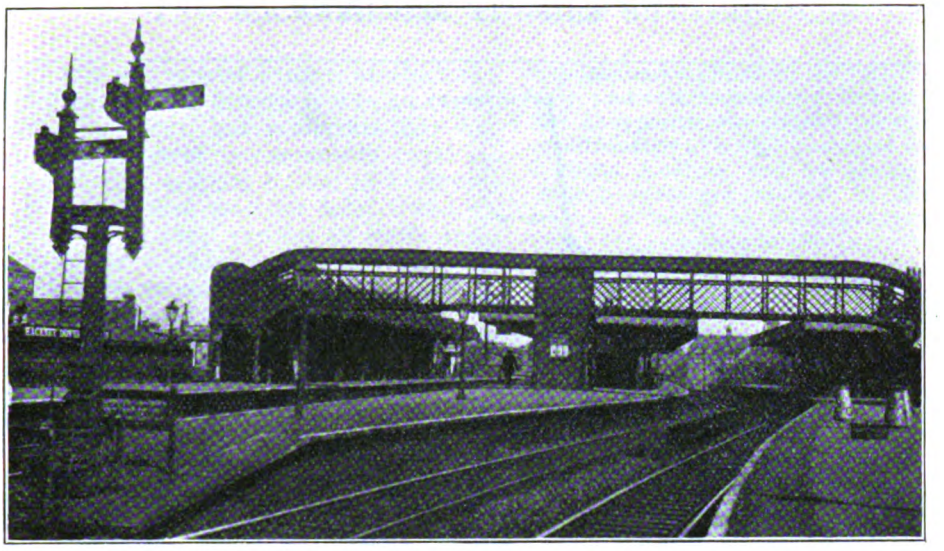

HACKNEY DOWNS JUNCTION.
Up and down "Suburban" lines to the left; "Fast" lines to the right.

The Hackney Downs Group of Lines, Great Eastern Railway.

A GREAT TRAFFIC DEVELOPMENT WHICH NOW CELEBRATES ITS JUBILEE.

By J. F. GAIRNS.
(*Photographs by the Author.*)

IT is difficult to realise that it is fifty years since these lines, which now figure so prominently in Great Eastern Railway suburban traffic, were brought into use. Until then, Great Eastern lines in the London area consisted only of those from Shoreditch (Bishopsgate—now included in Spitalfields Goods Depôt) and the Fenchurch Street line (London and Blackwall and Blackwall Extension Railways) to Stratford, the main Colchester line, the Woolwich branch, and the Northern and Eastern Railway (Cambridge main line), together with the Loughton and Ongar, Walthamstow (from Lea Bridge to Shern Hall Street—now Wood Street), Enfield (from Angel Road via Lower Edmonton), and Hertford and Buntingford branches. For suburban traffic, only two of these were at all busy, the Woolwich branch, which had at least two and sometimes three trains from Fenchurch Street and one from Bishopsgate hourly, and the Loughton line, which at busy periods had two or even three trains hourly from Fenchurch Street, with an occasional one from Bishopsgate. On the Colchester line there were stopping trains to Brentwood about hourly (from Bishopsgate only), and the Cambridge line slightly improved on this by the combination of Broxbourne and Hertford stopping trains and Enfield trains (via Stratford, Tottenham and Angel Road). The Walthamstow branch had an approximately hourly service between Lea Bridge and Shern Hall Street, in connection with the Cambridge line local trains.

There was, therefore, nothing even remotely comparable with the conditions of to-day, but in 1872 the first stage leading up to the situation now so familiar was completed, when the Hackney Downs group of lines was brought into use. This

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REFERENCE

Lines owned by the Company	———
Lines partly owned	———
Lines leased or worked by the Company	- - - - -
Lines leased or worked jointly	.....
Lines over which the Company exercises Running Powers continuously	▪▪▪▪▪▪▪▪▪▪
Other Companies lines	———

MAP OF SUBURBAN LINES OF THE GREAT EASTERN RAILWAY.

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was part of a greater scheme, of which the Liverpool Street extension was an essential component, but until this also was opened no great developments could be made. The original station at Liverpool Street was first used for local trains on February 2, 1874, and for all traffic from November 1, 1875, from which date the Shoreditch terminus ceased to be used by passenger trains.

In the 'fifties and 'sixties the history of the Great Eastern and its constituent companies, notably the Eastern Counties, was distinctly "stormy." From the speeches made at the half-yearly and many special meetings it is apparent that there was a continual atmosphere of contention More than once an entirely new directorate was set up, and serious accusations of malpractices, intrigue, &c., were made. The chief trouble seems to have been the policy of promoting new lines, especially in country areas, whose remunerative possibilities were considered to be very uncertain, and many of which did not, in fact, pay their way for many years, while some, probably, hardly do so even now. In the early 'sixties steps were taken to obtain a new terminus in place of the badly situated Shoreditch station, which should provide increased accommodation not obtainable otherwise. In addition, the group of lines now under consideration was promoted. The situation is well summarised by the following extract from the report of the directors for the half-year ended December 31, 1863 :—

"The new lines which have been brought under the notice of the directors, and for which they considered it desirable, in some cases, to seek Parliamentary powers direct, and, in other cases, to assist those undertakings which are promoted by independent companies, are the following :—The Great Eastern Metropolitan Station and Railways, which comprise a line from the Enfield branch to Mile End, connecting with the main line at Tottenham, and carrying the present line to a new City terminus at the back of Broad Street, with an approach from Bishopsgate at the corner of Wormwood Street. With regard to the extension to Wormwood Street, your directors would remind the proprietors of the urgent necessity for an entire change in the present station accommodation, goods as well as passengers, which was shown in the report made to the board by your manager and engineer on the 17th December, 1862, and communicated to the proprietors. In that report it was pointed out that by the establishment of a City passenger station, in a better locality, and by giving up the present passenger station to the goods service, a saving in working expenses and toll of £15,200 would be effected. It was also shown that there would be a considerable return for the outlay on the new station, arising from the rent of the available space under it. This was estimated at £8,000 a year, but as the space under the now proposed station may not be so well let, it is estimated the return from that source will be £5,250 only, or at the rate of £750 an acre for 3½ acres. This would show that, besides the incalculable advantages of an improved City station, there would be a certain return for the money expended of £20,450 a year, which, at 4 per cent. interest, represents a capital of £511,250 ; but as the cost of the City extension will be, in round numbers, £730,000, therefore the whole amount of capital required for the new station, for which there will not be an available return, is under £220,000. Considering the great disadvantages of our present terminus, it can hardly be doubted that such an expenditure will be amply repaid by increased City traffic ; but, bearing in mind that all the other metropolitan railways are getting improved City termini, it is certain that the competition of those railways for all kinds of residential and excursion traffic will be injurious to the Great Eastern, unless they also come farther into the City, and have a more commodious station than the present one in Shoreditch. The importance of this company's suburban traffic will be felt when the fact is known that within eighteen miles of London the passenger traffic considerably exceeds £100,000 per annum, and it must not be forgotten that the present station, if retained, requires an immediate outlay of £300,000, and that the coal traffic at that part of the station now used for the North Woolwich and Woodford traffic would yield a net revenue of at least £15,000 to £20,000. The advantages to be derived from a West End terminus, or termini, do not in any respect diminish the necessity for improved City accommodation. Although the number of passengers requiring a West End station is considerable, and would be largely increased by such a station, those going to and from the City will always be the mainstay of the Great Eastern traffic, and it has been an increase of their numbers and their convenience at as small a cost as possible, combined with an increase and improvement of the goods yards, that has been the guiding principle in laying out the proposed station.

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1. **"LOCAL" LINES AT BETHNAL GREEN JUNCTION.**
"Suburban" lines to the right; "Through" lines behind up "Local" platform.
2. **"SUBURBAN" LINE PLATFORMS, BETHNAL GREEN JUNCTION.**
Down Enfield Town train running in.
3. **ENFIELD LINE PLATFORMS AT SEVEN SISTERS.**
4. **PALACE GATES LINE PLATFORMS AT SEVEN SISTERS.**
Auto-train used for local shuttle service; 1300 class 2-4-2 tank engine.

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"The Great Eastern High Beech branch is a line from near Stratford, through Walthamstow, to High Beech. This line will pass through the centre of a district on which there is very much land now being built upon, even more so than on the Loughton branch. On this latter branch the directors have ascertained that the company derives a large return upon the capital expended, and upon this basis they feel assured the result of the High Beech line will be a similar success."

Proposals were also made for a Tottenham and Farringdon Street line which eventually developed into the Tottenham and Hampstead Joint line. Together, these new works necessarily involved heavy expenditure and the atmosphere of the half-yearly meetings was systematically "stormy" from the time these schemes were first promoted until their realisation, a period of some ten years.

The view of these proposals current at the time is well expressed by two extracts from an editorial published in the *Railway News* dated November 19, 1864:

The London terminus of the Great Eastern Railway has always been an unsavoury and unsuitable locality, and not even the change of name from Shoreditch to Bishopsgate has ever made it one whit more attractive. While all other lines were pushing forward to the centre of the metropolis, it would have been strange indeed if the Great Eastern had not shared in the same general desire. By an Act of last session the company obtained powers to advance the station to Liverpool Street, side by side with that of the North London. The company sought for powers to make the station at Wormwood Street, but the committee—very wisely, we think—determined that it should stop at Liverpool Street, in a line with the North London terminus.

It could not be expected that passengers from Lancashire or Yorkshire wishing to visit London would be pleased with a *detour* which would give them a view of Stratford-le-Bow and the interesting network of railways which swarm at Hackney Wick and revel in the swamps and marshes of this famed locality. So, with an eye to the future, the Great Eastern obtained powers to make a line straight and direct enough to satisfy even the wishes of the Czar Nicholas, who laid out the St. Petersburg and Moscow by a straight line drawn with a ruler, or, as some say, with the back of his sword. This line branches out of the Enfield line near Edmonton, and runs direct by Stamford Hill, Clapton, and Dalston to the City terminus in Liverpool Street, throwing out in its way at the Seven Sisters Road a small spur to tap the main Cambridge line at Tottenham. This portion of the railway runs through a district which will yield a very large residential suburban traffic, in addition to giving a more direct communciation northwards. There are no heavy works, and the estimates for its construction, considering its near proximity to London, are exceedingly moderate. The length of the new line to be made, including the branches and junction, is 15½ miles, and the cost is £1,363,000, including, of course, in the estimate, the extension to Liverpool Street. The line to the City terminus will leave the present main line at a place appropriately called "Tap" Street, about three-quarters of a mile from the present station at Bishopsgate, and will be continued for some distance on arches by the side of the present line, cross Bishopsgate near Worship Street, and follow the course of the North London to Liverpool Street.

These remarks were, of course, written when only the schemes had been presented, and years elapsed ere the lines were made, including certain modifications, and not a few stormy episodes at meetings of shareholders. In fact, at a later stage, a frequent comment was to the effect that so much expenditure had been incurred that the directors considered it best to go on with the schemes initiated by their predecessors.

The "Metropolitan Extensions Railways" were authorised by Acts of July 29, 1864, June 19, 1865, July 15, 1867 and July 30, 1868 (this included the Alexandra Park or Palace Gates branch), with others covered modifications of the schemes, extensions of time, &c., though it was not until 1872 that any part was brought into use. The lines thus included were as follows: Bethnal Green to Hackney Downs, thence to Lower Edmonton to join the Enfield branch from Angel Road, and from Hackney Downs through Clapton to join the Cambridge line at Tottenham, with a branch across to the Walthamstow line. These were all opened for traffic in 1872, as mentioned, the Liverpool Street extension following in 1874–5, as already stated. Other sections were added as follows: Walthamstow to Chingford, 1873 (the extension to High Beech, or as it is now spelt "High Beach," was never made); Palace Gates branch, October, 1878, including the connection from the Cambridge line through South Tottenham; and the Tottenham and Hampstead Joint line, July, 1868 to May, 1888. The

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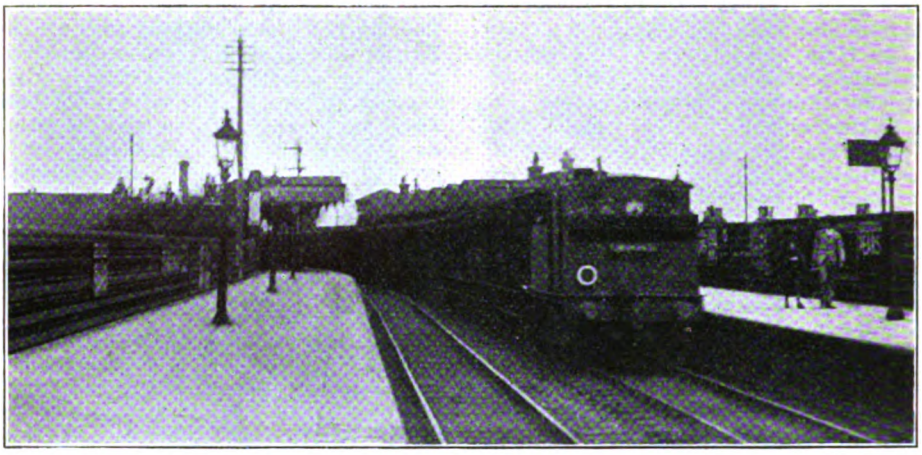

UP ENFIELD TOWN—LIVERPOOL STREET TRAIN RUNNING INTO LOWER EDMONTON (HIGH LEVEL) STATION.

Edmonton and Cheshunt line is of later construction, opened October, 1891.

From the first the policy of providing liberal train services was adopted, thus laying the groundwork for the tremendous traffic which these lines have carried for nearly forty years. The writer has not been able to consult a time-table immediately following the opening of these lines. It has been stated that the service consisted of four stopping trains to Stoke Newington, two expresses to Hackney Downs and Stoke Newington and all stations onwards to Enfield, and two Walthamstow trains hourly. It is difficult to appreciate that this applied from the original opening in August, 1872, when trains had to use the old Shoreditch terminus; more probably this was the service when local trains were transferred to Liverpool Street in 1874. In 1876, however, there were trains in each hour as follows :—

0.3 Chingford.
0.10 White Hart Lane.
0.25 Enfield.
0.33 Wood Street, Walthamstow.
0.40 White Hart Lane.
0.55 Enfield.

There were extras at busy periods and

ENFIELD TOWN TERMINUS.

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a few 1st and 2nd class only "fasts." Certain Cambridge line locals also served Hackney Downs and Clapton.

It will thus be seen that even at that time these lines were given generous facilities, and in conjunction with the policy of exceptionally cheap workmen's fares developed in due course, including 2d., 3d., 4d. and "Cheap Fare" trains covering the early morning hours in stages up to 8.0 a.m., a tremendous traffic was built up. Thus, in 1915, there were 2d. trains from Enfield at 4.40, 4.59, 5.32, 5.47, 5.57 and 6.8 a.m., from Seven Sisters at 6.29 a.m., from Wood Street at 5.0, 5.24, 5.32, 5.45, 5.51, 6.5 and 6.41 a.m., from Hoe Street at 6.36 a.m. and from St. James's Street, Walthamstow, at 6.14 and 6.35 a.m., together with two non-stop trains at 6.17 and 6.22 a.m. from Edmonton Low Level station, for which special tickets were issued according to the accommodation. These were followed by 3d. trains from Enfield at 6.22 and 6.45 a.m., Bush Hill Park, 6.54 a.m., Palace Gates, 6.21 and 6.59 a.m., Wood Street, 6.47, 6.54 and 6.58 a.m., and two further reserved non-stops from Edmonton Low Level station at 7.9 and 7.18 a.m. These special non-stops travelled via Angel Road and Tottenham, and, if not booked to call at Hackney Downs, thence via Stratford to Liverpool Street. There were also cheap fare trains at 4d. or 5d. or similar amounts, and other facilities for journeys completed before 8.0 a.m., together representing what was probably the most generous service of workmen's fares ever offered.

These arrangements are now correlated with the standard workmen's facilities, especially as present early traffic is not so heavy, owing to the changes in working hours. But there is now an exceptional service on all these routes, based upon the "intensive" services of July 12, 1920.

Thus, on the Walthamstow line, after the "All-night" service inaugurated June 21, 1897, has been completed by the 4.31 a.m. from Wood Street, there are 13 trains from Chingford between 4.48 and 7.28 a.m. (the last to reach Liverpool Street before 8.0 a.m.) and 7 from Wood Street. Between 8.0 and 9.0 a.m. 11 trains from either Chingford or Wood Street reach Liverpool Street, and 9 between 9.0 and 10.0 a.m. A very large proportion of all these trains is fast, in some instances serving only two stations for "picking up" purposes. From Enfield 17 trains reach Liverpool Street by 8.0 a.m., with one special workmen's train at 7.12 a.m. from Lower Edmonton (High Level station) and one at 7.18 a.m. from the Low Level station. travelling via Tottenham and Stratford, Nine trains arrive at Liverpool Street between 8.0 and 9.0 a.m., including two from Palace Gates, and 10 between 9.0 and 10.0 a.m., again a large proportion semi-fast.

The characteristics of the special "intensive" service, however, are best indicated by the down service, of which a 20-min. sequence is as follows:—

5.18 Wood Street (*a*)
5.20 Enfield Town (*b*)
5.22 Chingford (*c*)
5.24 Enfield Town, with Palace Gates connection at Seven Sisters (*d*)
5.28 Wood Street (*a*)
5.30 Enfield Town (*e*)
5.32 Chingford (*c*)
5.34 Palace Gates (*d*)

(*a*) Fast Liverpool Street to St. James' Street.
(*b*) Passes Bethnal Green, London Fields, Rectory Road.
(*c*) Passes Cambridge Heath and London Fields.
(*d*) Passes Cambridge Heath, London Fields, Hackney Downs.
(*e*) Passes Bethnal Green, Cambridge Heath, Rectory Road.

During the quieter hours of the day trains run at 5-minute intervals alternately to Chingford or Enfield, in each case alternately fast or semi-fast, and on accelerated schedules at times when short trains are used instead of the standard sets of 16 four-wheelers. As trains run early and late the result is one which is probably unparalleled elsewhere, except on the London electric Underground and "Tube" lines. It will be recalled that for these services the Great Eastern Railway introduced distinctive bands of colour above the doors of 1st and 2nd-class carriages, yellow for 1st and blue for 2nd—hence the term "Jazz" services, "invented" by one of the London newspapers.

All the local Enfield, Palace Gates, Walthamstow and Chingford trains are now dealt with exclusively at platforms 1–4 at Liverpool Street, and at busy periods are so arranged that trains leave these platforms in order: 4 (Wood Street

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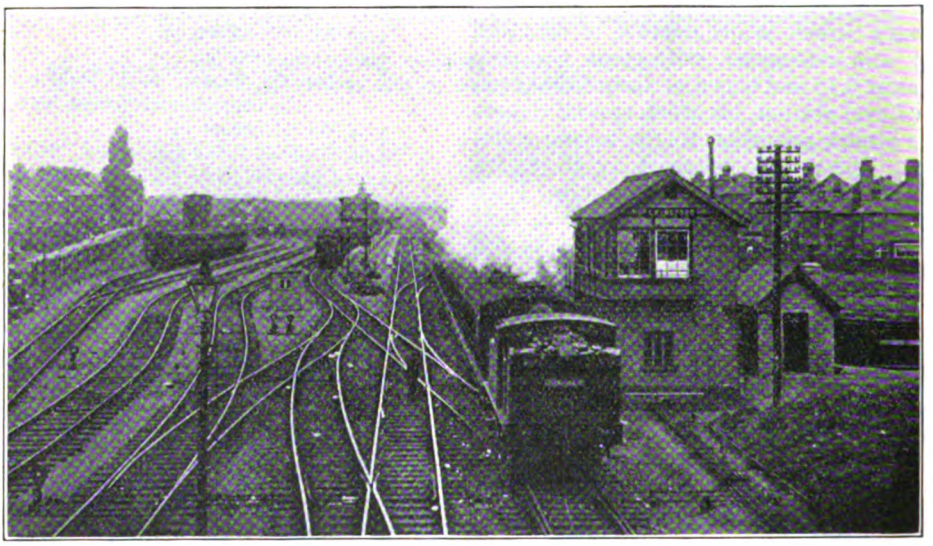
" fasts "), 3 (Enfield), 2 (Chingford) and 1 (Enfield or Palace Gates) at 2-minute intervals, followed by one of 4 min. before starting a second series of 4 trains. Arrivals are so timed that they do not conflict with departures, the 4-minute interval permitting of a crucial " crossing " of paths taking place clear of a conflicting departure. The special arrangements associated with this service have, however, already been explained in the pages of the RAILWAY MAGAZINE, including the alterations at Liverpool Street, Wood Street, Enfield and Chingford, and the signalling developments.

Leaving Liverpool Street all these trains use the " Suburban " lines, passing through the additional tunnel lines at Bishopsgate station (now closed) built when Liverpool Street was enlarged in 1894. At the top of the bank of 1 in 70 all these trains use the " Suburban " lines at Bethnal Green Junction, but beyond the platforms they have a connection to the " Fast " lines for Cambridge Line traffic, which diverge from the " Local " lines of the Colchester route. Certain of the Walthamstow trains thus transfer to the " Fast " lines, the latter being also used by Cambridge line locals and expresses which pass through Bethnal Green Junction on the " Local " lines from Liverpool Street. Occasionally, Walthamstow " fast " trains are sent from No. 4 platform via the " Local " lines, but this is not usual, as these lines have more than enough traffic of their own at busy periods. Therefore the service of 4 trains in 10 min. has to be conducted entirely on the " Suburban " lines, obtaining relief—in view of varied stopping arrangements—only by the transfer of some of the Walthamstow or Chingford trains to the " Fast " lines north of Bethnal Green.

Cambridge Heath and London Fields have no platforms on the " Fast " lines, for which reason nearly all the Walthamstow and Chingford trains miss these stations. At Hackney Downs there are platforms to all lines. At the south end the connections between " Fast " and " Suburban " lines are now rarely used, but at the north end trains can diverge from the " Suburban " lines towards Enfield or Clapton, the " Fast " lines serving only the latter route. Some of the Cambridge line locals call at Hackney Downs and Clapton, but otherwise all the traffic of these stations is dealt with by the Enfield, Walthamstow, Chingford and Palace Gates services.

Beyond Hackney Downs it is two-track only to Enfield, with stations at frequent intervals. At Seven Sisters a connection comes in from South Tottenham, by which



UP TRAIN LEAVING CHINGFORD TERMINUS.
The illustration shows sidings for storing sections of trains during the " light train " period.

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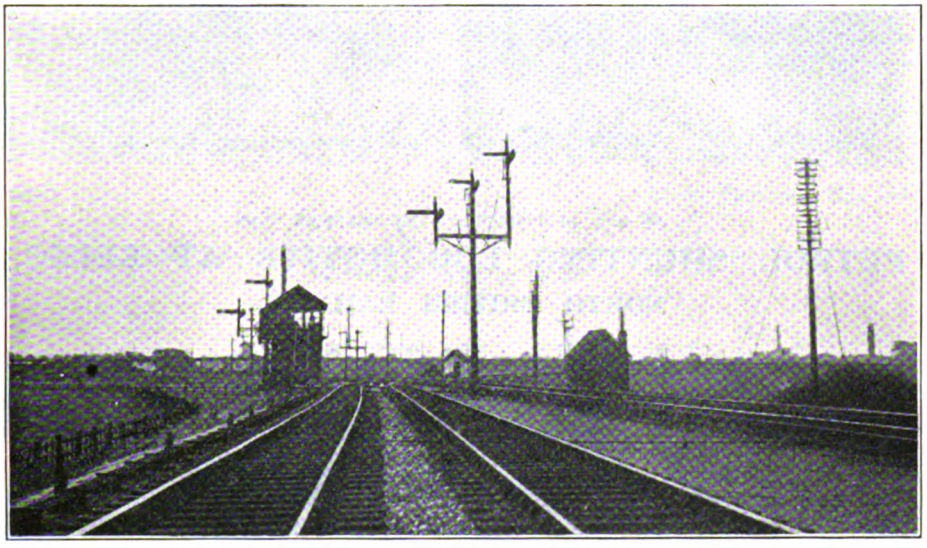
trains run between Woolwich and Palace Gates approximately hourly. This is also used by goods trains and by engines going direct to or from Stratford. There are complete junction platforms at Seven Sisters, but locals to and from Palace Gates (usually auto-trains) use only the up platform, and are safeguarded by an installation of the SYX train stop, which ensures that they shall not under any circumstances foul the junction, besides permitting through trains on the Enfield line to approach the junction simultaneously, without being checked, as would otherwise be necessary under signalling regulations.

Beyond Lower Edmonton there is a connection from the Low Level station, the original one, but now very little used. A little further on the Edmonton-Cheshunt line diverges, but this is now not used even for goods traffic to any great extent. At Enfield there are three platforms, a large equipment of sidings, and special arrangements to facilitate dealing with the frequent service of trains.

Returning to Hackney Downs, Cambridge Line and Walthamstow and Chingford trains descend on a fairly sharp curve to the tunnels towards Clapton, passing the Queen's Road platforms, never, however, brought into use as a station. Beyond Clapton, after crossing the River Lea, main line trains diverge by a sharp curve to join the old Cambridge main line from Stratford and Lea Bridge, while Walthamstow and Chingford trains go over the old route and join the original line from Lea Bridge to the Walthamstow branch. There is also a curve connecting the main line with the Walthamstow branch from the north. These and other connections in this area permit of trains travelling in many directions, and all these possibilities are regularly used, though principally for goods traffic and by light engines to and from Stratford. At Wood Street there are terminal sidings beyond the station. Higham's Park is a busy station for residential traffic of a good class. At Chingford there are four platforms, and extensive sidings.



COPPER MILL JUNCTION

View from Tottenham direction. Goods lines to the left; lower signals for curve to Walthamstow line or onwards to Lea Bridge and Temple Mills. Passenger lines to the right; higher signals (left to right), to Walthamstow line, to Lea Bridge and Temple Mills, and via Clapton curve to Hackney Downs route. In background direct route between Walthamstow and Clapton used by Liverpool Street–Chingford trains can be seen crossing main line to Stratford.

Apart from the regular services of the Clapton - Tottenham - South Tottenham-Lea Bridge-St. James' Street area, the following may be mentioned: (1) Stratford (occasionally Liverpool Street) to the Cambridge Line via Lea Bridge and

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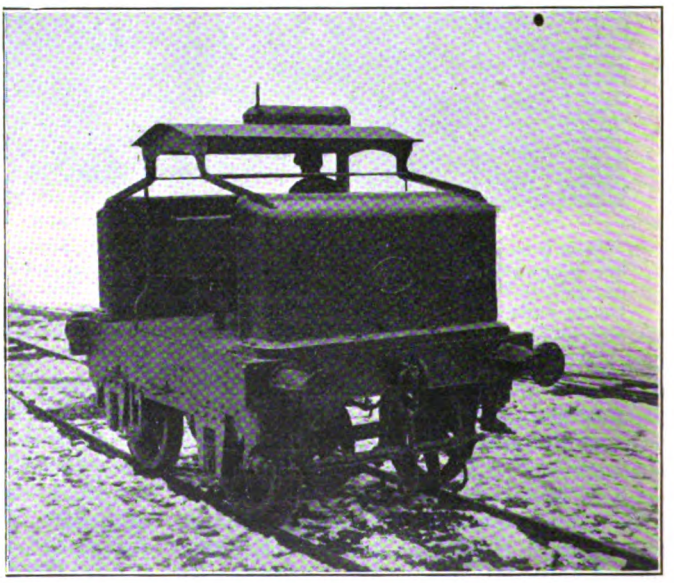
Tottenham; (2) Woolwich (via Stratford, low level) and Lea Bridge to Chingford (Bank Holidays—and this year also throughout the summer months—there used to be regular trains from Stratford to Chingford); (3) Gospel Oak to Chingford (now only run on Bank Holidays); (4) Gospel Oak to Tottenham (a few trains daily); (5) St. Pancras to Cambridge main line (restored this summer after lapsing for several years, except for occasional specials); and (6) the Palace Gates-Woolwich trains already mentioned.

It will thus be seen that the construction of the Hackney Downs group of lines not only changed essentially the characteristics of Great Eastern Railway traffic, and opened the way for developments which not even the most sanguine of the supporters of the lines opened in 1872 could have anticipated, but also created, in conjunction with some of the connecting lines built later, a wonderful system of inter-connections which is of great value in the routing of goods traffic and the movements of light engines and empty trains clear of the busy passenger traffic routes. Incidentally, it caused an almost complete separation of the traffic of the Cambridge and Colchester main lines, and by setting up a distinct line of demarcation between the suburban services via Stratford and via Hackney Downs, cleared the way for the exceptional facilities now provided on both sections of the Great Eastern Railway.

PETROL SHUNTING LOCOMOTIVE AT KELSO, NORTH BRITISH RAILWAY.

BY the courtesy of Mr. Walter Chalmers, Chief Mechanical Engineer of the North British Railway, we are enabled to illustrate and briefly describe a four-wheeled petrol locomotive employed in the company's yards at Kelso for shunting purposes. This locomotive was built by the Motor Rail and Tram Car Company Limited, and is stated to be giving satisfactory results, taking the place of three horses which formerly performed the shunting work at Kelso.



The engine is a 40 b.h.p. internal-combustion motor having four water-jacketed cylinders. The transmission comprises heavy roller chains driving each axle, in combination with a gearbox providing two speeds in both directions. The locomotive is equipped with a standard screw brake operating cast-iron brake blocks on all wheels, also sanding gear with pipes to all four wheels adapted for delivering sand when running in either direction. The engine is fitted with four spring plunger buffers and two central spring couplings.

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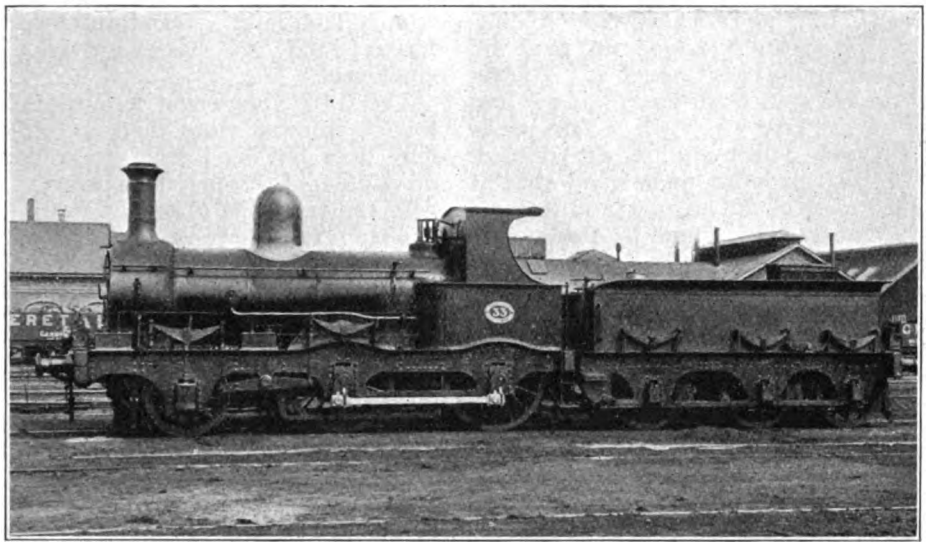

Photo.] [*Loco. Publishing Co., Ltd.*

2-4-0 PASSENGER LOCOMOTIVE, No. 33.

Built by the Vulcan Foundry Co., 1875. Coupled wheels, 5 ft. 2 in. diam. Cylinders, 16 in. by 24 in.

Locomotive and Train Working in the latter part of the 19th Century.

TAFF VALE. [No. 1.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

THE Taff Vale can boast that it is the oldest public railway in Wales, for it was opened in 1840 from Cardiff Docks to Merthyr, a distance of 24¼ miles. An almost equally important line was added a few years afterwards; this branched off the main line at a station then known as Navigation House, and ran in a north-westerly direction to Aberdare. Navigation House, as a station, has disappeared from the time-tables long ago, and been replaced by Abercynon. Pontypridd, now the largest and busiest station on this line, did not exist as such, but was camouflaged under the English name of Newbridge. Nevertheless Pontypridd eventually came into its own, and has since become the hub of the Taff Vale wheel, from which all the important spokes radiate, the one to the north-west going through Porth to Treherbert, and at Porth throwing off another branch to Ferndale.

On the south side of Pontypridd, about two miles from the latter, there is a branch which runs off in a south-westerly direction to Llantrissant on the Great Western South Wales main line, and on the south side of the latter another branch runs from Llantrissant to Cowbridge and Aberthaw on the coast. Cowbridge has apparently not yet reached the high pre-eminence of Newbridge to necessitate being re-christened Pontybuwch, or something of that sort, in the railway time-tables.

Finally, to complete the Taff Vale lines, there are the branches from the main line near Radyr, and from the Great Western main line to Penarth Dock and Cadoxton.

There are two large passenger stations on the railway, both of which are modern.

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The one at Queen Street, Cardiff, was opened in 1887, and is a handsome building. Only one down and one up road for passenger trains pass through it. I never saw the old station at Cardiff, as my first visit to the city was made a few weeks after Queen Street station was opened, but I was given to understand that it claimed most of the architectural features of a moderately glorified fowl-house. However, it has gone now as a passenger station and nothing further need be said about it.

The other large station is Pontypridd, which is now about twice the size of Cardiff station, but this modern structure is a product of the present century. Pontypridd being the most important junction on the railway, averages about double the number of passenger trains when compared with Cardiff Queen Street, and if the incessant procession of coal trains in one direction and empties in the other be included, Pontypridd may be considered to be one of the busiest railway centres in Britain.

The line falls naturally from the valleys in which the collieries are situated, towards the sea, and this is of great advantage in the working of the heavy mineral traffic to the docks at Cardiff and Penarth. Passenger trains of course do not benefit from this, and have one stiff pull on their northward journeys, on the main line to Merthyr, on which there is a gradient of 1 in 40 from Abercynon up to Quaker's Yard for a distance of somewhat more than a mile. Otherwise, though the line rises steadily, the gradients between Cardiff and Merthyr are not unduly severe, but they are heavier on the Treherbert branch. There are also various isolated lengths of 1 in 40 upon some of the branches, and one bit of 1 in 36 on the Ferndale branch, beyond the latter station. The worst gradient has to be negotiated by coal empties only. This rises at the rate of 1 in 13 for a distance of 40 chains in the vicinity of an unpronounceable place spelt Pwllyrhebog, not far from that welter of Glamorganshire virtue, Tonypandy. Locomotives of a special design work over this gradient, but are assisted by a wire rope, which is arranged so that one end is attached to the engine of the train ascending the gradient. The rope passes round a heavy pulley at the top and the other end is attached to the tail of a descending train. The latter, therefore, helps the former, and no stationary engine is employed.

The Taff Vale being a local railway, though it owns more than 100 miles of line, does not lend itself to a detailed description of passenger train services, and with the exception of one or two isolated non-stop runs between Pontypridd and Llandaff (8¾ miles) did not pretend to any "express" trains. The passenger train services were, however, run at fairly frequent intervals, and served all stations. Most of the through trains north of Cardiff ran to Merthyr or Treherbert, and a few to Aberdare. South of Cardiff most of the main line trains travelled to and from the Docks station, but the most important service in this direction was that from Queen Street station to the Great Western station and thence to Penarth.

The older passenger engines, most of which were at work until 1880–5, were built between 1852 and 1860 by various firms, and consisted of a select band of undersized 2–4–0 tender engines with double frames and outside cranks. The cylinders were only 14 in. by 20 in. and the coupled wheels had a diameter of 5 ft. 2 in. How they got up the Abercynon bank with the Merthyr trains, goodness knows, but they are stated to have been banked up by another engine, however small the load. The old Abercynon bank was considerably steeper than its present rate of rise, and was flattened out to 1 in 40 only in 1864. Before this, stationary engines were employed, and locomotives did not work trains over it.

The small size of the above passenger engines is a sort of reminder that the Taff Vale was not made as a passenger line, but was intended for the conveyance of coal, so that to some extent passengers were held to be an unnecessary but unavoidable nuisance. Consequently, an improved passenger train service, and suitable locomotives for working it were much more modern innovations.

It was not until 1875–1878 that Mr. T. Hurry Riches, who had then been chief locomotive engineer for about two years, placed in service three tender passenger engines of an enlarged class for main line trains. Like their small predecessors, these were also of the 2–4–0 type with double

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frames, but had 16 in. by 24 in. cylinders and 5 ft. 3 in. coupled wheels. Two of them, Nos. 33 and 34, were built in 1875 by the Vulcan Foundry, and the third engine, No. 41, came out in 1878 from the Taff Vale works at Cardiff. They were pretty little engines with polished brass domes, and like all the four coupled locomotives used for passenger work, including both tender and subsequent tank engines, they were painted a red-brown colour, somewhat similar to that of the Furness Railway. On the appearance of the No. 33 class, a few of their diminutive predecessors migrated to some of the branch lines, and were subsequently sold or scrapped.

had a diameter of 4 ft. 8 in. They were really rebuilds of 0–6–0 double-framed goods engines, with the trailing ends lengthened and altered to allow the substitution of a bogie for the trailing coupled wheels. They had polished brass domes and were painted the red-brown colour of the passenger engines, and when I first saw them in 1887 most of the class were working between Pontypridd and Llantrissant, and also thence to Cowbridge. With the exception of No. 59, the others disappeared just about the end of the century.

The above engines had a total wheel-base of 21 ft. 10 in., of which the distance between the centres of the coupled wheels

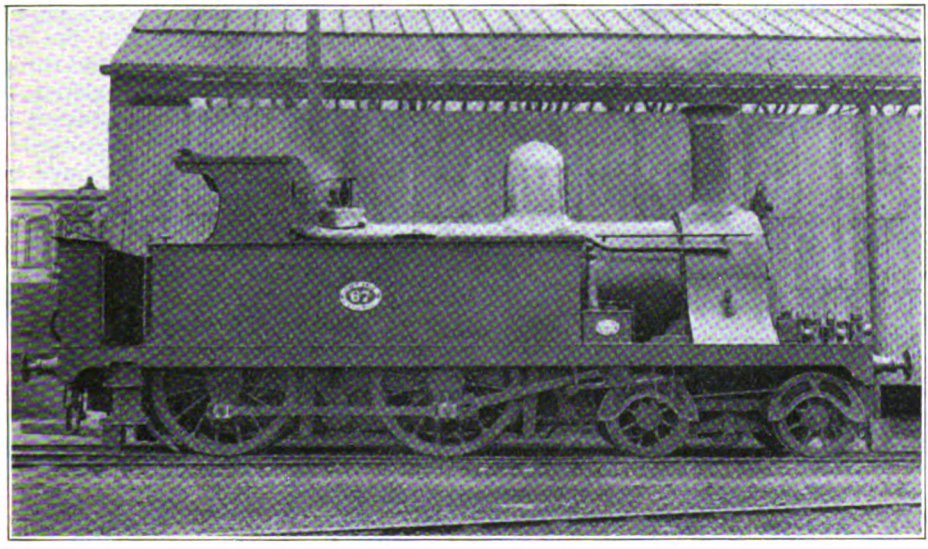

Photo.] **4-4-0 TANK ENGINE, No. 67.** [*Loco. Publishing Co., Ltd.*

Built at Cardiff, 1884. Coupled wheels, 5 ft. 3 in. diam Cylinders, 16 in. by 24 in.

Although the Taff Vale was a local railway with no trains exceeding a run of 24½ miles, it was at that time worked almost entirely by tender engines, both as regards passenger and coal traffic, and there were less than 20 six-coupled tank engines in service.

During the period 1878–1883 four 0–4–4 passenger side-tank engines were turned out from the company's works at Cardiff, numbered 4, 5, 59 and 66. These had double frames and outside bearings for the coupled wheels, but the trailing bogie had inside bearings. The cylinders were 16 in. by 24 in. and the coupled wheels was 7 ft. 2 in. The bogie wheels had a diameter of 2 ft. 9½ in. The boiler carried 130 lb. pressure and had a total heating surface of 902·4 sq. ft. The tanks were of fairly large size, and had a capacity of 1,177 gallons.

In 1884 Mr. Riches designed an entirely new type of passenger tank engine for main line service. These may be said to have been derivatives of the North London 4–4–0 tank engines with outside cylinders, having a slight downward inclination, and they were very similar in appearance and design to four tank engines built some years previously for the neigh-

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bouring Monmouthshire Railway. Three of the new class, Nos. 67 to 69, were built in 1884–5 at the Taff Vale Works at Cardiff and were the only ones of the type.

The outside cylinders were 16 in. by 24 in., the coupled wheels had a diameter of 5 ft. 3 in., and the bogie wheels of 2 ft. 9½ in. The total wheelbase was 20 ft. 6½ in., and that of the coupled wheels 7 ft. 10 in. The boiler was pressed at 140 lb. and had a total heating surface of 956 sq. ft. The side tanks had a capacity of 960 gallons, and the total weight of the engine in working order was 45 tons 8 cwt.

Only three of this class were built, and for some time they worked between Cardiff and Merthyr and also to Treherbert. Like the preceding passenger engines, they had chimneys with polished brass tops, brass dome covers, and were painted red-brown.

The policy of the company in respect to passenger traffic appears to have undergone a change about this period, and thenceforth every attempt was made to cultivate it, with the result that it increased to such an extent, and the trains grew to such a length that the engines hitherto employed became too light for the work. A number of the trains had to be worked by the 0–6–2 mineral tank engines, which were first introduced in 1885, but their small 4 ft. 6 in. wheels rendered them somewhat unsuitable for some of the traffic.

As a result, an entirely new and much more powerful type of tank engine was put into service in 1888. This was of the 4–4–2 type with inside cylinders, and was the first engine of this well-known design, now so common on British railways.* The cylinders are 17½ in. by 26 in., with the valves on the top worked by link motions and rocking shafts. The coupled wheels are 5 ft. 3 in. diam., the bogie wheels 2 ft. 9 in. diam., and the trailing radial wheels 3 ft. 8¼ in. diam. The total wheelbase is 26 ft. 6½ in., that of the coupled wheels being 7 ft. 10 in. The total heating surface was 1,212·7 sq. ft. and the boiler pressure 160 lb. The tanks carry 1,600 gallons of water, and the weight of the engine in working order is 54 tons.

* The 4-4-2 type of tank engine with *outside* cylinders is at least eight years older.

Of this class, Nos. 170 to 172 were built by the Vulcan Foundry in 1888, and Nos. 173 to 175 by the same firm in 1891, and these six engines were the last with four coupled wheels to be built for the Taff Vale, all later engines having six coupled wheels.

One of these engines, No. 173, was the cause of the bad accident in August, 1893, which occurred to a train from Merthyr to Cardiff, on the main line about 2 miles south of Pontypridd, at the junction where the Llantrissant branch diverges. This accident is of interest as showing the serious effect of a hidden flaw in a portion of an engine subjected to considerable alternating shocks. The springs of the coupled wheels being underhung, the spring buckle is connected in the usual manner to a large pin which passes through the keep and body of the axlebox, the connection being made by a heavy T link from which the spring is suspended. A hidden flaw, which could not have been discovered when the spring was on the engine, caused the T link to break, and the spring dropped sufficiently far for the spring buckle to strike a chair of the road. The shock of the impact broke the pillars which attach the ends of the spring to the frame of the engine, the spring became detached and was dragged along under the engine until it got underneath the wheels of the leading van of the train. The whole of the carriages left the rails, and the first six of them fell down the slope of the embankment, being totally wrecked. The engine broke loose from the train and ran forward for about 70 yards. Thirteen persons lost their lives as a result of this lamentable accident.

The passenger carriages on the main line services within my own recollection were always good, and showed none of the distinctly uncomfortable peculiarities of those which ran at the same period on the railways in the southern London area. Of course, the miners had to be provided with special stock without cushions, just as they are to-day on all other railways.

The first thing to strike the eye of a stranger on the Taff Vale carriages is the company's coat-of-arms—at least, that was my experience. There are some large railway companies in this country whose coats-of-arms are too involved to

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attract attention, and, on the other hand, there are other designs which one notices at once. Amongst the latter is the familiar London & North Western's Britannia. But the Taff Vale picture puts even Britannia completely into the shade, and is evidently emblematic of the whole of Wales, though the Taff Vale occupies only a very small corner of that country. It must be the goat that does it. He is perched on the top, evidently monarch of all he surveys, and you cannot miss him, even if you try. I like that goat. I have seen him marching at the head of a famous Welsh regiment with the same air of proud defiance that he shows on the Taff Vale carriages. But the animal which accompanies the goat, placed within an oval scroll beneath him, is by no means so majestic. At first glance he looks like a screaming eagle of the American pattern, but a closer examination shows him to be intended for something else. Some years after my first acquaintance with him, I learnt that, in addition to the goat, Wales claims a heraldic dragon, and I suppose, though I am open to correction, that the Taff Vale coat-of-arms endeavours to depict that animal, though I hope that the real Welsh dragon is of more respectable appearance. The Taff Vale variety—genus Draco Tonypandiensis—is a dancing, shrieking, riotous beast, engaged in putting out his tongue at the goat and doing his utmost to disturb the stately serenity of the latter. He would even shake up a Chinaman, who is popularly supposed to know something of the habits of his kind. Of course, this sort of destructive criticism is easy, and, therefore, I hasten to make amends by venturing a constructive suggestion, that the Taff Vale people get rid of the riotous dragon and replace him by some quiet and decorous emblematic animal—say, a Welsh "rabbit." Then all would be well, and "Cymru a fydd."*

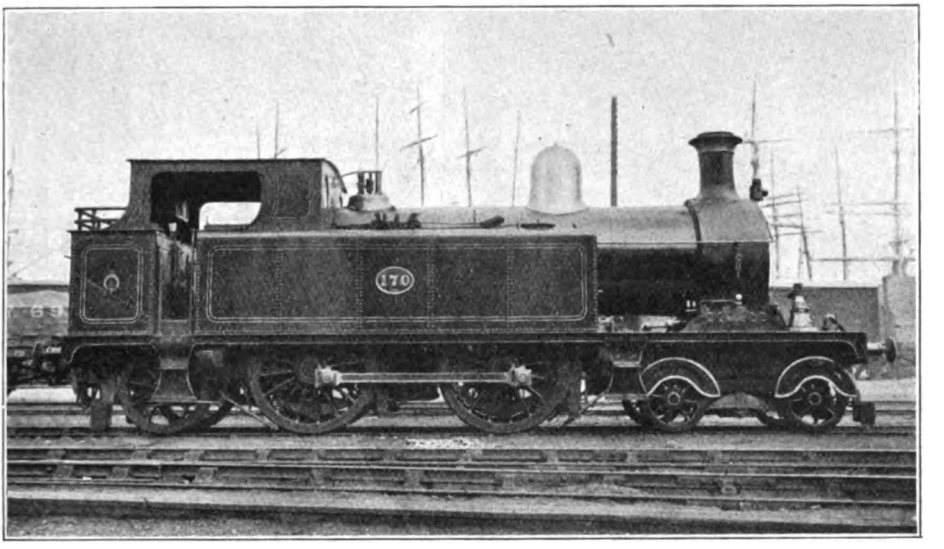

Photo.] **4-4-2 TANK ENGINE, No. 170.** [*Loco. Publishing Co., Ltd.*

Built by the Vulcan Foundry Co., 1888. Coupled wheels, 5 ft. 3 in. diam. Cylinders, 17½ in. by 26 in.

(To be continued.)

* I am sorry to say that the Taff Vale will not have the chance of making these constructive improvements, for, since the above was written, the Great Western has absorbed the Taff Vale Company.—E.L.A.

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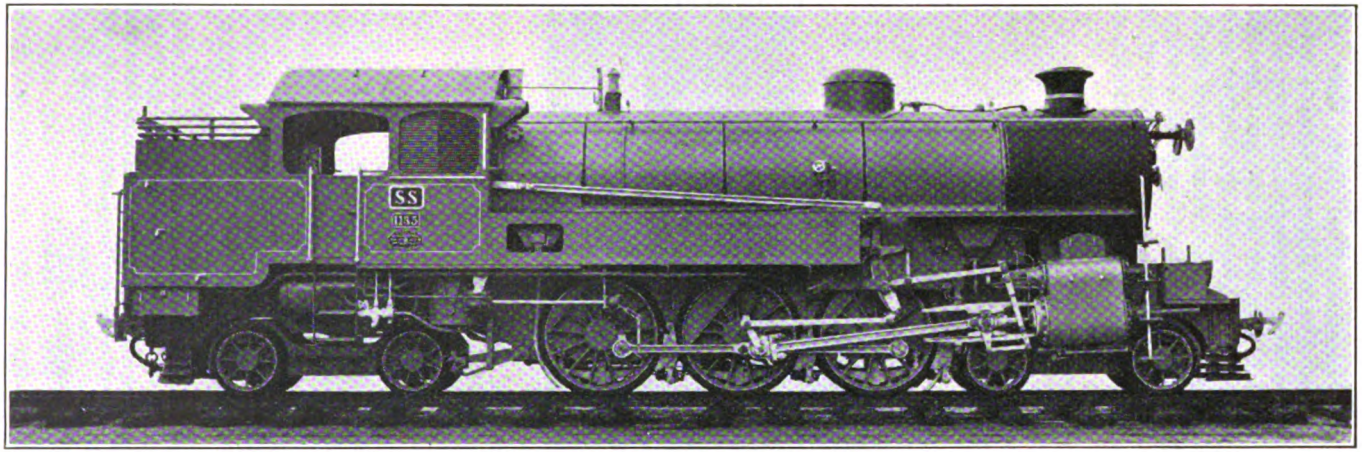
A BRITISH-BUILT 4-6-4 TANK ENGINE FOR THE DUTCH COLONIAL (STATE) RAILWAYS OF JAVA.



4-6-4 TYPE SUPERHEATED TANK ENGINE, DUTCH COLONIAL (STATE) RAILWAYS OF JAVA.

THESE engines have been built by Sir W. G. Armstrong, Whitworth & Co. Limited, for the Dutch Colonial (State) Railways of Java. They have outside cylinders, inside admission piston valves, extended smokebox, circular type regulator valves with pilot valve in centre, copper inside firebox, M.L.S. superheater, Friedman re-starting injectors, Ross "Pop" safety valves, Dewrance water gauges and cocks, and iron gauze spark arrester in the smokebox. A drop grate is fitted at the front end of the firebox. The crossbars for the firebars are notched, to give different spacing for burning either Indian or Australian coal or wood fuel.

Vacuum, steam and hand brakes are fitted. A large acetylene head lamp is placed in front of the chimney and two smaller lamps on either side in front of the smokebox. Green and red discs are fitted in front of these lamps, and are operated from the cab, the discs being used for signalling purposes. A Hasler speed indicator is fitted on the right-hand side of the cab, in full view of the driver.

The following are the leading particulars :—

Cylinders, diam., 17⅜ in.	Wheelbase, rigid, 9 ft. 10 in.
Piston stroke, 21⅝ in.	,, total, 32 ft. 7¾ in.
Coupled wheels, diam., 4 ft. 5⅛ in.	Heating surface, total 1,468 sq. ft.
Bogie wheels, diam., 2 ft. 6⅜ in.	Grate area, 20 sq. ft.
	Working pressure, 176 lb.

The engine in working order weighs 66 tons, of which 32·5 tons are available for adhesion. It develops a tractive force, at 85 per cent. of the boiler pressure, of 19,300 lb., giving a ratio tractive force for adhesion of 3·8. The coa-lcarrying capacity of the bunkers is 3 tons, and water-carrying capacity of front and rear tanks combined of 2,000 gallons. The locomotive is built to run upon the 3 ft. 6 in. gauge.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A.M.Inst.T., A.I.Loco.E.

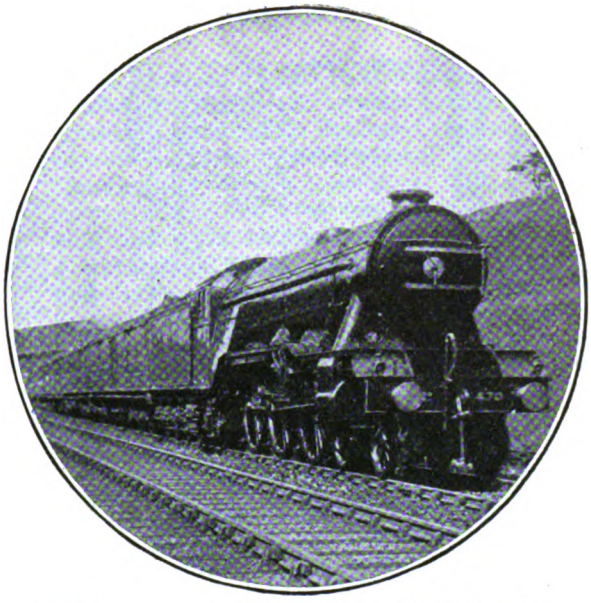

Photo.] [*Chas. S. Lake.*

GREAT NORTHERN RAILWAY.

Up Harrogate and Leeds express, hauled by 4-6-2 engine No. 1470.

IT is my intention to devote the present article exclusively to locomotive performance on the Great Eastern Railway. Such an article is considerably overdue; so much so, indeed, that a correspondent who wrote me recently took this absence of Great Eastern records for granted as indicating that there was nothing about Great Eastern Railway performance to warrant description. Far from it; the shortage indicates lack of opportunity of collating records on my part rather than any lack of merit in the work of Great Eastern engines. During the last twelve months, however, I have made a number of journeys over the Great Eastern Railway system, and the results of the observations so made, or some proportion of them, are those now about to be detailed.

It needs an intimate acquaintance with the peculiar difficulties of the Great Eastern Colchester main line for the observer to be able to appreciate, in any way adequately, the demands made upon the locomotives, and in regard to certain of the feats performed by the latter, especially upon the down Hook of Holland Continental express, readers are warned in advance that I am going to be frankly enthusiastic. For a 65-ton engine hauling a load rather over seven times her own weight, over a route of 69 miles with a total vertical rise of 685 ft. and no less than four severe service slacks intermediately (all but one in a bad low-lying location for subsequently regaining speed) at an average speed throughout of 50·4 m.p.h., the times in the last two columns of the first table are to my mind simply extraordinary. With all allowance for the fact that, by the kindness of Mr. A. J. Hill, the Chief Mechanical Engineer, I was privileged to ride upon the footplate on these two trips, and any influence that this may have had on the work done, I had previously thought it a matter of impossibility for time to be kept on this schedule with a train of such magnitude, until I actually saw it done.

It is essential for me to present the profile reproduced herewith, in order that readers may grasp the significance of the times given in the two tables. The constantly-changing gradients have as far as possible been averaged in order that the figures may be the more readily understood. On the down journey the rise at 1 in 70 to Bethnal Green makes a bad start; then, when the engine is getting nicely away, there comes the 30-mile-an-hour slack through Stratford. From there the recovery is up gradually rising grades to 15·9 miles, where begins the formidable

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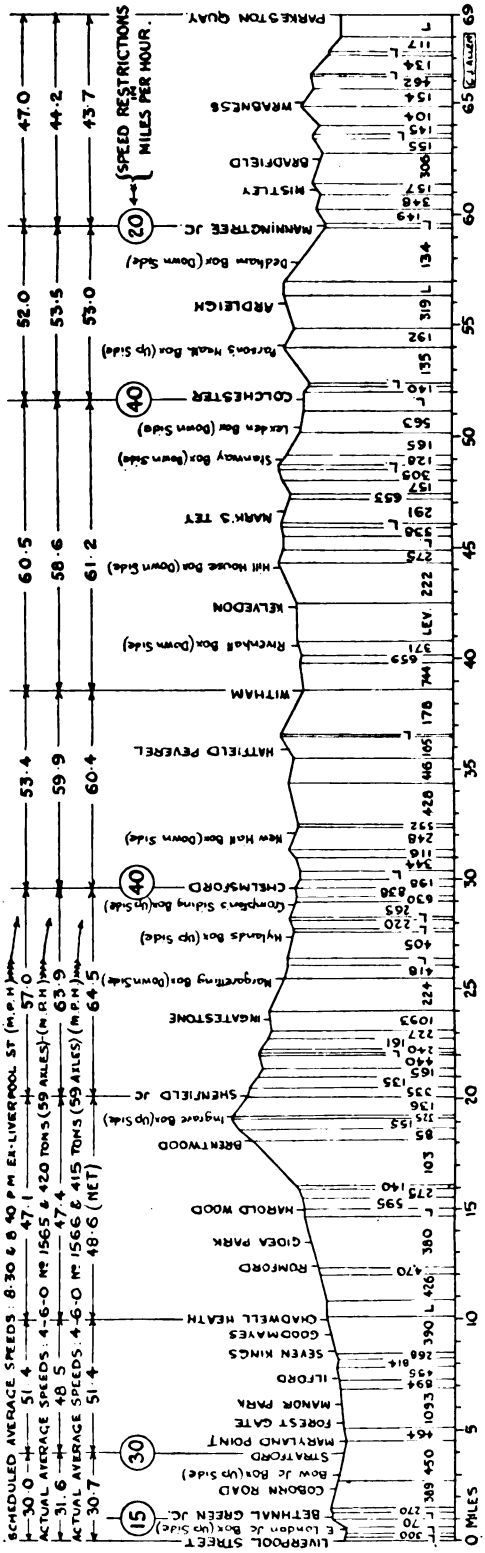

GRADIENT PROFILE, LIVERPOOL STREET TO PARKESTON QUAY, HARWICH, GREAT EASTERN RAILWAY.

ascent to Ingrave Summit, averaging about 1 in 105 for 3·3 miles, but as steep for one short length as 1 in 77, and known as Brentwood Bank. From Ingrave at last a decent "galloping ground" presents itself, but the speed is cut short by the 40-mile speed order at Chelmsford, with a recovery beyond up rising grades. Sharply undulating grades ensue to Colchester, where the 40-mile restriction is always carefully observed, and is immediately followed by a steep ascent to Parson's Heath; after this comes the swift descent to Manningtree, where the far worse restriction of 15 m.p.h. for trains taking the Harwich branch precedes yet another sharp bank up which to recover speed. Thus there is barely a breathing space anywhere; it is hard going all the way.

The up Continental trains are worse off, as the ascents from the Manningtree, Colchester and Chelmsford slacks are all more severe in the London-bound direction; further, the high speeds attained on the Brentwood descent cannot be maintained for any great distance with propriety, owing to the difficulty of observing signals at speed in the short blocks of the suburban area; and at the conclusion there comes the Stratford slack, and another 10-mile order for up trains at Bethnal Green. Here, then, is ample explanation as to why Great Eastern times cannot, in the nature of things, be as spectacular in character as those of certain other companies who are blessed with beautifully straight and comparatively level main lines; all circumstances considered, however, I am prepared to maintain that the work done on these down Continental journeys is equal to the best that this country can produce anywhere, proportionately to the size and tractive power of the engines concerned.

I had made several journeys on the down Hook of Holland train before the first one shown in the table, but as they were at the coal dispute period, or immediately afterwards, I do not propose to describe them, as time-keeping was utterly impossible on the apology for fuel that was the only thing then available. So we come on to Martin's journey with No. 1501 in the first column. A signal check at Bridge Box brought us down to 25 m.p.h., but we accelerated well from Stratford, passing Romford at 54 m.p.h.

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and Harold Wood at 55 m.p.h.; minimum rate on "the bank" was 33·1 m.p.h., and thus we succeeded in keeping the very stiff 13-minute schedule from Chadwell Heath to Shenfield. Descending to Chelmsford we were running at 70½ m.p.h. below Ingatestone, and so regained our lost minute and passed the county town on time; maintaining a general average of 60–61 m.p.h. over the undulations thence to Witham, we passed the latter at 68 m.p.h., a minute early. It will be noted from the table that the allowance of 20 minutes for the 18·4 miles from Shenfield to Witham is the only part of the schedule on which the engines are able systematically to improve; from Witham onwards there is absolutely nothing in hand. Falling only to 55 m.p.h. up the 1 in 222 to Hill House, we touched 64½ m.p.h. at Lexden before the unusually severe slack through Colchester, which, together with a worse one at Manningtree—to a walking pace—accounted for about 3¾ min. of our running time. On arrival we were therefore 4 min. behind time, but allowing for the three checks, the net running time was not more than 81½ min.

GREAT EASTERN RAILWAY, 8.30 P.M. LIVERPOOL STREET—PARKESTON QUAY.

Engine No. / Driver / Load (axles) / Load (tons tare) / Load (tons full)	Distance.	Schedule.	1501 Martin 50 325 345	1500 Diaper 50 325 345	1567 Chapman 50 325 345	1565 C. Osborne 59 388 420	1566 Chapman 59 388 415
	miles	min.	m. s.	m. s.	m. s.	m. s.	m. s.
Liverpool Street ..	0·0	0	0.00	0.00	0.00	0.00	0.00
Bethnal Green Junc. ..	1·1	—	3.15 (sigs.)	3.30 (sigs.)	3.25 (sigs.)	3.10	3.25
Stratford	4·0	8	7.55	9.40	8.25	7.35	7.50
Ilford	7·3	—	12.50	14.35 (sigs.)	12.50	12.05	11.55
Chadwell Heath ..	10·0	15	16.05	18.30	15.55	15.00	14.50
Romford	12·4	—	18.50	21.30	18.40	17.40	17.25
Harold Wood	15·0	—	21.50	24.40	21.45	20.35	20.15 (sigs.)
Brentwood	18·2	—	26.00	29.05	26.10	24.40	24.25
Ingrave Box	19·3	—	27.55	31.15	28.10	26.40,	26.25
Shenfield	20·2	28	29.05	32.30	29.25	27.55	27.40
Ingatestone	23·6	—	32.20	35.55	32.50	31.15	31.00
Crompton's Box ..	28·9	—	37.10	40.45	37.45	36.00	35.40
Chelmsford	29·7	38	38.05	41.35	38.35	36.50	36.30
New Hall Box ..	32·1	—	40.45	44.15	41.25	39.35	39.00
Hatfield Peverel ..	35·9	—	44.25	48.00	45.15	43.25	42.50
Witham	38·6	48	47.00	50.45	47.55	46.05	45.35
Kelvedon	42·3	—	50.25	54.15	51.20	49.40	49.10
Mark's Tey	46·6	—	54.55	59.00	55.45	54.30	53.40
Lexden Box	50·4	—	58.30 (p.w.r.)	62.40	59.10	58.10	57.05
Colchester	51·7	61	60.20	64.15	60.35	59.30	58.25
Parson's Heath Box ..	54·1	—	64.20	67.20	63.30	62.20	61.10
Ardleigh	56·0	—	66.55 (p.w.r.)	69.45	65.50	64.45	63.35
Manningtree	59·5	70	71.30	73.25	69.55	68.20	67.20
Mistley	61·2	—	76.00	76.05	73.05	71.35	70.15
Wrabness	65·1	—	80.50	80.45	77.45	76.20	75.20
Parkeston Quay ..	68·9	82	86.00	85.45	82.05	81.05	80.15
Net times (min.) ..	68·9	82	81½	83	81	81	80

Diaper's effort, with the pioneer engine of her class—No. 1500—suffered less from checks than the first run; for some unknown reason we were turned local road from Bethnal Green to Bow Junction, which involved a severe slack at the latter, and then we got signals on at Seven Kings. We did not rise above 53½ m.p.h. at Harold Wood, and fell to

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29 at Ingrave, so passing Shenfield 4½ min. late. From there we gained 1¾ min. to Witham, but lost a minute on to Parkeston, despite a slightly faster negotiation of Manningtree curve than usual. Maximum speeds were 70½ m.p.h. below Ingatestone, 65 at Witham, 67 at Lexden, and 65 at Dedham; we fell to 53 m.p.h. beyond Chelmsford, 52½ at Hill House, and 42 at Parson's Heath. On the branch the lowest speed at Wrabness was 48 m.p.h., and we touched 61 as we swung round the big curve down to the Quay at Parkeston. Even allowing for the two delays, and notwithstanding the subsequent excellent running, I am inclined to think that we could not have made the journey in less than 83 min. net.

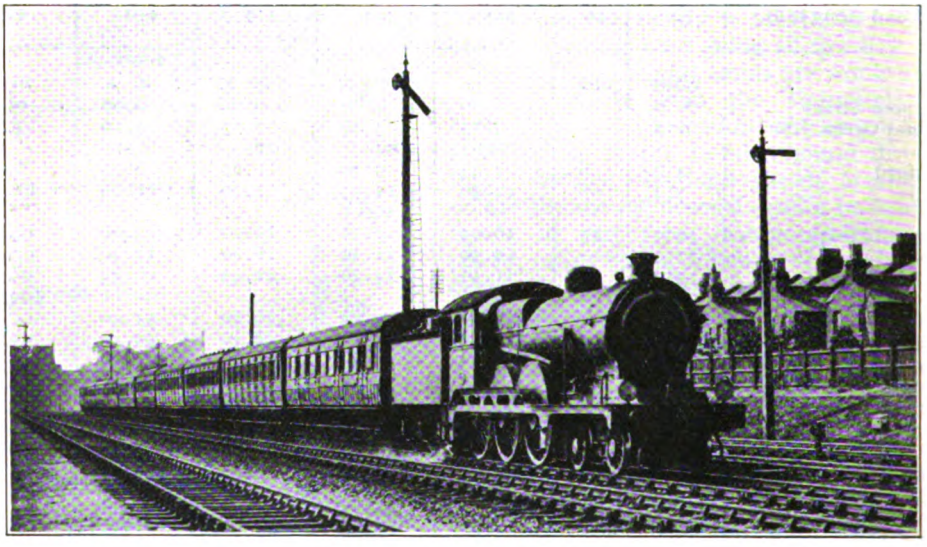

Photo.] GREAT EASTERN RAILWAY. [*F. E. Mackay.*

Down Yarmouth Pullman Car express. 4-6-0 locomotive, No. 1518.

Chapman's work on the next trip was a model in every respect, and particularly as regards the scrupulous care with which all speed restrictions were observed. Signals troubled us again at Bridge Box, but after that we got a perfectly clear road. We were doing from 50 to 50½ m.p.h. from Ilford to Chadwell Heath, and accelerated thence to 53½ at Harold Wood; the bank was topped at 31½ m.p.h., but we dropped ½-min. on the Chadwell Heath-Shenfield section—always a crucial test. On to Witham, where we had just won back to schedule, the speeds were a little less high than usual—67 at Margaretting, and a minimum of 50 at New Hall—but we reached 68 through Witham, and made a fine time thence to Colchester, with a lowest rate of 55 at Hill House, and a maximum of 68 m.p.h. at Lexden. At Parson's Heath we were down to 43½ m.p.h., and then, not exceeding 60 on Dedham bank, we were through Manningtree dead on time. This was the precursor to an exceedingly fine effort along the branch—the 12 min. allowance from Manningtree to Parkeston constitutes what is probably the most difficult part of the whole booking—wherein we worked up to 31½ m.p.h. on the first, and did not fall below 42 on the second, section of Mistley bank, and then topped Wrabness summit at 54 m.p.h., the last being a particularly notable figure. So we drew up at Parkeston almost on the stroke of 9.52 p.m., our net time being a minute under the 82 allowed.

And now we come to my two down footplate journeys, which are really in a class apart. When I joined Driver Chris Osborne on No. 1565 on the first of them—on a Friday evening in late July—his train was already made up to ten corridor 8-wheelers (including dining cars),

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a 6-wheeler, and two 42-ton 12-wheeled Pullmans, but such was the rush Hollandwards that we had to come off at the last minute and fetch yet another corridor coach, bringing the tare weight up to the formidable total of 388 tons, and the gross weight behind the tender, with some 400 passengers and a large quantity of luggage, to fully 420 tons. It was quite evident, as I watched Fireman Knappett's preparations prior to the start—sleeves gradually to 48½ m.p.h. at Ilford, 53 at Seven Kings, and 54 at Romford; on Brentwood Bank, with this 420-ton train, the absolute minimum speed on the 1 in 77–89 (the steepest part of the bank, just above Brentwood station) was 32·8 m.p.h.—an extraordinary figure. Just above the foot of the bank the regulator was advanced from three-quarters to full open, and at Brentwood station cut-off was increased from 30 to 40 per cent.,

GREAT EASTERN RAILWAY, 6.32 A.M. PARKESTON QUAY—LIVERPOOL STREET.

Engine No. / Driver / Load (axles) / Load (tons tare) / Load (tons full)	Distance.	Schedule.	1518 — 40 272 285	1567 Martin 40 272 285	1505 Kettle 40 272 285	1566 Chapman 48 324 340
	miles	min.	m. s.	m. s.	m. s.	m. s.
Parkeston Quay	0·0	0	0.00	0.00	0.00	0.00
Wrabness	3·6	—	8.55	8.55	8.25	7.10
Mistley	7·7	—	13.40 (p.w.r.)	13.50	13.05	11.25
Manningtree	9·4	14	16.30	16.10	15.15	13.25 (sigs.)
Ardleigh	12·9	—	23.40	22.15	21.50	20.05
Colchester	17·2	25	29.40 (p.w.r.)	26.55	27.00	24.50
Mark's Tey	22·3	—	37.45	33.25	33.30	30.55
Kelvedon	26·6	—	42.40	38.00	38.15	35.25
Witham	30·3	41	46.15	41.25	41.50	38.40
Hatfield Peverel	33·0	—	49.15	44.40	44.50	41.25
Chelmsford	39·2	52	55.45	51.05	51.10	47.20
Crompton's Box	40·0	—	56.40	52.05	52.15	48.15 (sigs.)
Ingatestone	45·3	—	63.10	58.40	58.10	54.35
Shenfield	48·7	64	67.30	62.45	62.20	58.30
Ingrave Box	49·6	—	68.55	64.00	63.35	59.40
Brentwood	50·7	—	70.25	65.00	65.00	60.50
Harold Wood	53·9	—	73.15	68.35 (sigs.)	68.00	63.35 (sigs.)
Chadwell Heath	58·9	75	78.15	78.00 (sigs.)	73.05	73.30
Stratford	64·9	83	85.00	85.20 (sigs.)	80.10	80.30 (sigs.)
Liverpool Street	68·9	91	92.40	94.20	87.35	93.00
Net times (min.)	68·9	91	88	88	87½	80

rolled up, and a hand-cloth with knotted corners replacing his cap—that stern business was afoot. A beautiful start was made, without an atom of slip. Bridge Box "distant" threatened us for a moment, when we were doing a good 50 an hour past Bow Junction, but steam was on again immediately, and we were through Stratford in record time.

There was never another signal check right through to the finish. Speed rose where it remained to the top, thus showing that the engine still had more reserve power in hand; as a result of Knappett's expert firing, all the steam required was readily available, and the working pressure was well maintained. The result was that we *gained* 5 seconds on schedule time from Chadwell Heath to Shenfield, passing the latter in what was, up till that time, my record exit figure from Liverpool Street. The previous best was on the old "Norfolk

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Coast Express," behind No. 1501, with a 51-axle train, when we took one second more.

From the summit we got away with great rapidity, maintaining 69–70½ m.p.h. from Ingatestone to Crompton's Box; after Chelmsford slack we kept up between 54 and 60 m.p.h. all the way to Colchester (cut-off 30 per cent., and regulator from one-third to one-half open), save for maxima of 65 m.p.h. at Witham and 67 at Lexden, and a minimum of 50 at Hill House. "It means hard going to keep time on from Colchester," said Osborne in my ear, "but we'll just wheel her up, and she'll do it all right." And so she did, in triumphant fashion; Parson's Heath witnessed a minimum of 44½ m.p.h., and we did not exceed 65 in descending to Manningtree; there we had 1¾ min. in hand, and so were able to drop ¾-min. on to Parkeston without impairing our ability to arrive a minute before time. A clear minute *early*! As has been said already, if you had asked me before we started how we were likely to do, the reply would have been that I did not see how it was possible to keep time! And thus it was Osborne and Knappett, experts both of them, combined to falsify my expectations.

So we come on to the following Tuesday, when I joined Driver Chapman and Fireman Dale, on No. 1566, and found that in the meantime 59 axles had become for a while a daily formation, so that we were again to pull out with over 400 tons behind the tender—415 tons on this trip, I estimated, in view of a rather smaller passenger complement. It must be confessed that the crew were not entirely unaware of what had been done on the previous Friday, and so were distinctly on their mettle. The engine helped them by being in perfect order for the trip, and for the second time in succession the weather was beyond reproach. When the "right-away" was given, we could not start for a moment, owing to a belated carriage train crossing our track, and so were a minute late away, the moment's delay, and the head of steam thereby raised, causing the engine to prime slightly until we were through Bishopsgate. True to its reputation, Bridge Box once again showed us a "distant" at danger, but we got a clear road almost at once, and suffered no delay. We were destined to suffer several alarms of the same kind, however, on this truly thrilling journey.

Once through Stratford, Chapman got some astounding work out of his engine.

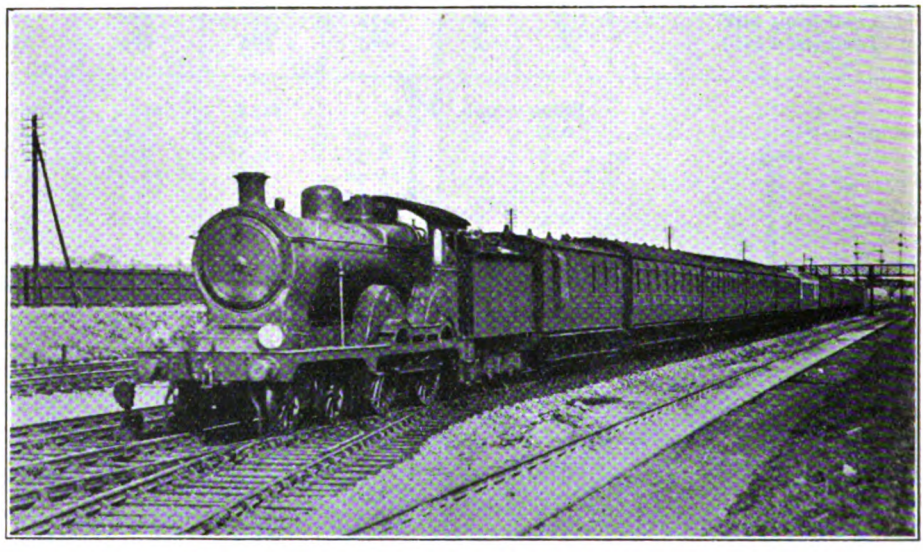

Photo.] GREAT EASTERN RAILWAY. [*F. E. Mackay.*

Up Clacton-on-Sea Pullman Car express. 4-4-0 superheater engine, No. 1854.

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It will be seen that, from Stratford to Harold Wood, the times of every other trip were left well behind; indeed, we were maintaining a level 55 an hour all the way from Chadwell Heath to the bottom of the bank, up a grade steepening from 1 in 426 to an average of 1 in 383 beyond Romford, which is all but as steep as the London & North Western Railway ascent to Tring. We sighted Romford Junction distant at danger as we passed Crowlands, but all the Romford signals fell clear just in time; half-way up to Brentwood, however, when we were going magnificently, Brentwood Yard signals were record of 27 min. 40 sec. from Liverpool Street to the same point. Both these times would certainly have been further cut by at least 15 sec. but for the check on the bank. Onwards to Chelmsford also we continued to run in noteworthy fashion, getting up to a sustained 71½ m.p.h. beyond Ingatestone, and making another surprising time—8 min. 50 sec.—for the 9·5 miles from Shenfield to Chelmsford. Thus, by passing the County Town in 36½ min. from London, we had recovered our late start, and gained half-a-minute in addition.

Engine and crew would have continued

Photo.] [*W. J. Kohning.*

MIDLAND RAILWAY (LONDON, TILBURY & SOUTHEND SECTION).

9.36 a.m. Ealing–Shoeburyness through vestibuled train approaching Dagenham.
4-6-4 superheater tank locomotive, No. 2107.

"on," and obstinately refused to fall until, alas, we had shut off and dropped several miles per hour of our pace. Cut-off at this stage of the climb had been 40 per cent., with regulator full open; this Chapman now advanced to 50 per cent., and it was literally in "full cry" that we mounted through Brentwood station and the cutting beyond, waking all the echoes in the neighbourhood. The engine was equal to every demand made upon her, and, despite the check, we made the truly magnificent time of 12 min. 50 sec. from Chadwell Heath up to Shenfield, not to mention a clear and substantial this brilliant progress indefinitely and gladly, but for the fact that extreme record-breaking achievements were neither necessary nor desirable; we had won back to schedule, and an easier rate of travel was now the order of the day. So Chapman brought his cut-off back to somewhere about 25 per cent. and the regulator to the second port (about one-quarter); this is not to say, however, that the engine did not continue to perform some remarkably fine work. Witham was passed at 66 m.p.h.; an adverse distant threatened at Rivenhall, but did not compel more than a few seconds' shutting off steam; we

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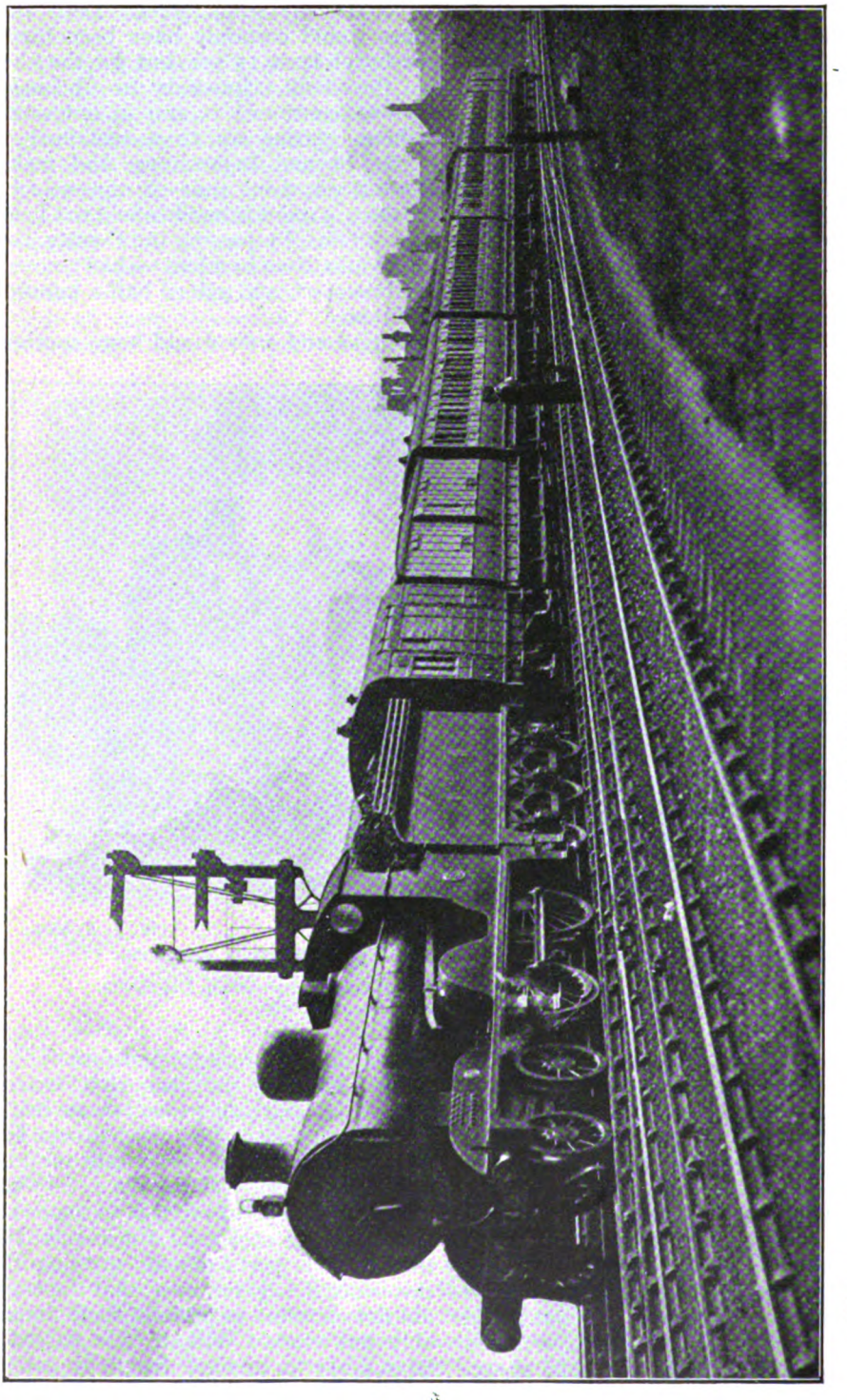

Photo.] FURNESS RAILWAY. [*F. E. Mackay.*

Whitehaven train leaving Carnforth. 4-4-0 locomotive, No. 131.

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topped Hill House at 50 (regulator was opened to three-quarters for the short climb), and attained 70½ m.p.h. down Lexden bank. This took us through Colchester in 58½ min. from London. Throughout the run Chapman's driving was the work of an artist, constant variations of regulator and reverse positions being made to meet every change of gradient, large and small, and the impression on the observer was that of perfect acquaintance with every topographical feature of the road, coupled with an equally exact knowledge of the capabilities of the engine. In his work he was most ably backed up throughout by Fireman Dale, who always had the needle up at the 180 lb. mark, even at the most exacting periods; the *ensemble* presented by these two, no less than their quiet enthusiasm, was delightful to watch, and the same applies also to the driver and fireman with whom I made the previous journey. The remainder of this trip presented no specially noteworthy feature, and we reached Parkeston in 80¼ min. from Liverpool Street, or 80 min. net, if not a shade under; that is to say, we had this time gained *two minutes*—with 59 axles!

As an example of the speed of which Great Eastern engines are capable, note should be taken of the five successive times over the 30·2 miles from Shenfield to Lexden, inclusive of Chelmsford slack, and several sharp, if short, lengths of adverse gradient. These five times were 29 min. 25 sec., 30 min. 10 sec., 29 min. 45 sec., 30 min. 15 sec., and 29 min. 25 sec., the average speeds with trains of 345 to 420 tons varying from 60 to 61·6 m.p.h. It will also be seen that the actual times over the 51·7 miles from Liverpool Street to Colchester, with the one badly-delayed exception, were all between 58½ and 60½ min., and so inside schedule time; net *average* time works out at about 59 min. 35 sec., or under the even hour. The famous "Norfolk Coast Express," of pre-war years, with a booked load of 48 axles, or about 330 to 335 tons full, was allowed 64 min. to Colchester, and that is sufficient to demonstrate the outstanding character of these runs. It is only fair to add that the Continental "link" includes Drivers E. Osborne and Pryor, in addition to C. Osborne and Chapman, who between them are responsible almost exclusively for the working of these important expresses. From all accounts they can each one put up equally good work, and their achievements reflect considerable credit on Parkeston shed, to which they are all attached.

The up journeys tabulated may be dismissed with more brevity, as the lighter loading of the train concerned—the Antwerp and Zeebrugge boat train—made them somewhat inferior in importance to the down runs, let alone the much easier timing. As a matter of fact, on the first three of them the time allowance was 93 min., but this has now been tightened up to the 91 min. which obtained at the time of the fourth run, the 2 min. being deducted between Parkeston and Shenfield. On No. 1518's run we attained 27 m.p.h. up the 1 in 134 from Parkeston to Wrabness, and 28 up the similar grade from Manningtree, after a slack to walking pace; at Witham we were running at 64 m.p.h.; and, after a minimum of 41 at Ingrave, we touched 71½ at Harold Wood. Getting a clear road through to the terminus, we arrived within the then booked time, delays notwithstanding.

Martin's start with No. 1567 was similar to the previous one, except that it was undelayed; from Manningtree we attained 34 m.p.h. up Dedham bank, and then followed some fine running from Colchester to Chelmsford, with a top speed of 65 m.p.h. at Witham. At Shenfield the train was 3¾ min. early, according to the times then ruling; so we fell to 38 m.p.h. at Ingrave, and only reached 69 on Brentwood bank, after which we encountered severe signal delays, and arrived late. Net time, however, was well on the right side of schedule. Kettle started some 5½ min. late, on a very misty morning, there being in parts quite a thickish fog. A good start was made to Manningtree, but from there we fell to 26½ m.p.h. on Ardleigh bank; then we made another good "sprint" from Colchester to Chelmsford, running at 64½ m.p.h. from Kelvedon to Witham; a fine recovery from Chelmsford slack took us over Ingrave Summit with no lower rate than 41½ m.p.h.; but, owing to fog, we did not exceed 69 on the bank, and had to run cautiously from Harold Wood onwards, although we were fortunate in getting a clear road. So

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practically all the late start was recovered on this smart trip.

Now we come to Chapman's magnificent run tabulated in the last column. As compared with last year, the Antwerp train has grown by a couple of bogie vehicles, and now loads quite substantially (and in this connection I may remind readers that the 8.40 p.m. down at night has precisely the same 82-min. schedule to Parkeston as the Hook of Holland train); we were thus a shade heavier than the old "Norfolk Coast" formation, which always occurs to one's mind as a species of "standard" in connection with Great Eastern performance. The morning was misty, and the engine was inclined to slip as we drew out of the Quay station, but once into speed, we got away in great style, and with regulator at about two-fifths and reverse at 30 per cent., improved slightly on the exacting initial time over the heavy grades of the branch to Manningtree. From this it will be seen that I was again on the footplate. We were then accelerating splendidly up the 1 in 134 to Ardleigh, when Dedham signals refused to allow us passage, notwithstanding the most frenzied appeals from the whistle, until our speed had been brought down to 10 m.p.h.

Getting away again from this check, with regulator at three-fifths, and reverse at 35 per cent., we still managed to do so well as to pass Colchester on time, and no easy allowance at that; the check had probably cost us rather over a minute. Regaining speed from Colchester check up Lexden bank, the next feat was the maintenance of practically "even time" from Colchester to Chelmsford; on the 1 in 128 we were down to 43 m.p.h. (from 50½ at Lexden), but we then reached 57 at Hill House, 66 at Kelvedon and 67 at Witham, the last acceleration being over a practically level track. From there onwards speed varied from a minimum of 58½ m.p.h. up the short rise beyond Witham to 65 at New Hall, until the slack through Chelmsford. All along here cut-off was at 30 per cent., and regulator open about to the second port. After Chelmsford we had actually recovered to 60 m.p.h. at Hylands Box when once again we espied signals at danger—Margaretting—and were brought down to 40 m.p.h. Nevertheless, after a probable loss of another minute, we were up again to 55 on the short easy length midway between Shenfield and Ingatestone, and topped Ingrave at the remarkable figure of 48½ m.p.h. Shenfield was passed 5½ min. early.

Photo.] GREAT NORTHERN RAILWAY. [*Henry L. Salmon.*

Up Newcastle and York express. Three-cylinder 4-6-2 locomotive, No. 1471.

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Down Brentwood Bank we reached 76½ m.p.h., the engine riding with perfect steadiness even at this high speed; but this was the end of our gay progress, as signal checks then became serious, and we never had another chance. Our net time for the 53·9 miles from Parkeston to Harold Wood was 61½ min., and on the showing of the first and third runs a net arrival in 81 min. was a perfectly easy proposition; but the speed at Harold Wood makes it clear that we should certainly have lopped a minute at least from these times down to Ilford, leaving a net time from Parkeston to Liverpool Street of 80 min.—11 min. under schedule 7 min. more than the latter in which to complete the run—165 in place of 158 min. Beardmore-built 4–6–0 No. 1544 was at the head of the train, with Driver E. Matthews and Fireman P. Iles, of Stratford shed, in charge; the train is now worked alternately by Stratford and Norwich men. Tare load was 317 tons, and gross load, with a full complement of passengers and luggage, 340 tons. We got through Stratford in 7 min. 55 sec., and Chadwell Heath in 15 min. 40 sec., keeping up a good 53 m.p.h. when adverse signals compelled a crawl right through Romford to a stop at the "advance," which lasted a full half-minute, and was a

Photo.] **METROPOLITAN RAILWAY.** [*A. B. MacLeod.*

0-6-4 tank engine, No. 95, "Robert H. Selbie."

time—a fitting complement to the exactly equal journey time made by Chapman in the opposite direction. The congratulations that I extended to him and his mate on such achievements will, I feel sure, be warmly shared in by my readers, and it is especially to be noted that the engine was not being punished—on the up journey she was barely even "extended" at all—to secure their accomplishment.

By Mr. Hill's courtesy I was also allowed to make a footplate journey on the North Walsham non-stop, at 12.25 p.m. from Liverpool Street, and found the train made up exactly to the old "Norfolk Coast" load of 12 eight-wheelers, although with bad handicap. Starting up again on 30 per cent. cut-off, and with regulator a shade under one-half open, we accelerated with such rapidity as to pass Harold Wood, three miles away, at 48½ m.p.h., and we then breasted Ingrave Summit at 28 m.p.h., in 31¼ min. from Liverpool Street.

Shenfield was passed in 32½ min., 2½ min. behind time, but to such an extent were Matthews and his fine engine now able to "play" with this substantial train that, having advanced cut-off to 45 per cent., he fixed his regulator at the first port opening (the minimum possible), and thus we continued all the way to Ipswich. Touching 64½ m.p.h. at Mar-

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garetting, we were through Chelmsford in 42 min.; Witham was passed in 52 min. 10 sec., at 60 m.p.h., and we touched 64 on Lexden Bank before passing Colchester in 66 min. 55 sec.; Manningtree was breasted in 76½ min. at 65 m.p.h. —an inferior time to those of the Continental trains, of course, but all that the time-table demands, and at the expenditure of far less effort on the part of the engine. A generous supply of water was scooped from the troughs at Halifax Junction before we threaded Ipswich, 68·7 miles from town, in 87½ min. from the start, and still 1½ min. behind time.

The arrears Matthews now set about recovering, and so advanced his regulator to the second port, at the same time reducing the cut-off to 30 per cent. This produced some good speed up the gradually rising grades in the Gipping Valley, with a maximum of 53½ m.p.h. at Needham ere we commenced the ascent of Haughley Bank, on the 3 miles of which—mostly 1 in 131—we did not fall below 35 m.p.h. So the 12·9 miles from Ipswich to Stowmarket were run in 14 min. 5 sec., and the 6 miles over the summit to Finningham in 8 min. 10 sec. Regulator and reverse were now returned to their former position, but we covered the 8·4 miles from Finningham to Diss in 8 min. 10 sec., with a maximum of 71½ m.p.h.; ran the 5·5 miles on up to Tivetshall in 6 min. 5 sec. and the 12·3 miles thence to Trowse Upper Junction in 12¾ min. Total, 26·2 miles from Finningham in 27 min., and 92·6 miles from Shenfield (which include three bad service slacks and numerous severe adverse gradients) in 104¼ min., despite the easy steam under which the engine was running.

After crawling round the curves and over the swing bridge between the Upper Junction and Wensum Junction, we passed the latter, 114·8 miles, in 5 sec. under 140 min., or a shade under 137 min. net, which was the old "Norfolk Coast" time. The 1 in 80 rise from Whitlingham was tackled on 30 per cent. cut-off, regulator one-half open; touching 67 m.p.h. before Wroxham, we slackened there, as enjoined, and then mounted the subsequent steeply-rising grades to North Walsham under the easiest steam, arriving in 161 min. 50 sec. from London, or more than 3 min. early. Allowing for the Romford stop, I doubt if the net time was anything above the old "Norfolk Coast" allowance of 158 min., which would give us a gain to engine of 7 min., and it was a matter of considerable interest to note that all through the journey, save over the checked Romford-Shenfield length, the original sectional times of the

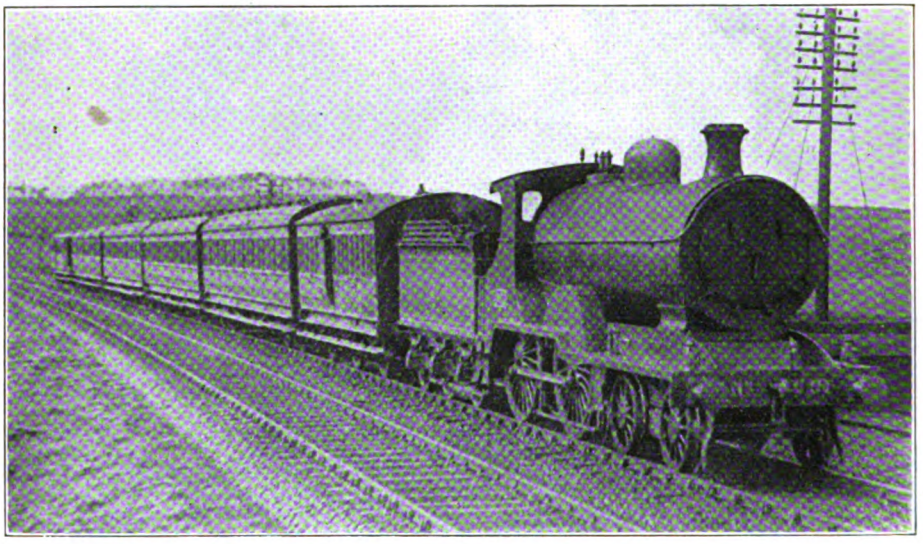

Photo.] GREAT SOUTHERN & WESTERN RAILWAY. [*Rex Murphy.*

9.30 a.m. Dublin-Cork express travelling at 65 m.p.h. Rebuilt 4-4-0 locomotive, No. 329.

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"Norfolk Coast Express" were run to with no greater variation at any point than 50 sec. either way. On stopping at North Walsham, Driver Matthews found his engine to be absolutely "cool" all round, and so ended a very successful trip, the short run on to Cromer having no features requiring note. Owing to Fireman Iles' skilful handling of his shovel, there was always an ample supply of steam, at an expenditure of fuel—as nearly as I could judge—not exceeding 32 to 33 lb. per mile covered—a very moderate figure in consideration of the load and the road traversed.

I had intended describing many other Great Eastern runs, but considerations of space forbid, and they might also appear in the nature of an anti-climax after the foregoing. But I cannot forbear mentioning one on which Driver C. Simmons, of Ipswich, with 4-6-0 No. 1518, was working the 6.35 p.m. express from Norwich to Ipswich, made up to nine 8-wheelers, or 255 tons in all, and was quite unaware his work was being recorded. We got away 15 min. late owing to the fact that the engine of the 3.10 p.m. down express from Liverpool Street, which was carrying our guard, had failed at Bramford, and had made that train over an hour late. First of all we cleared Trowse stop, 1 mile, in 3 min. 55 sec., and were thereby 1 min. "up." Mounting the 1 in 86 from the fresh start to the Upper Junction rather gently, we took 4 min. 5 sec. for this 1·2 miles, but then got away well, touching 64½ m.p.h. at the bottom of Flordon "dip," while the rising grades to Tivetshall, 2 miles of which are at 1 in 137, did not bring us below 53½ m.p.h. So the 8·7 miles from Upper Junction to Forncett were run in 10 min. 55 sec., the 3·6 miles to Tivetshall in 3¾ min., and the 5·5 miles on to Diss stop, with a top speed of 70½ m.p.h. at Burston, in 5 min. 55 sec. Total, 19 miles from Trowse in 24 min. 40 sec, instead of 26 min. Smart station work at Diss also helped to get us away only 12 min. late.

A remarkable climb was made to Finningham (8·4 miles, passed in 11 min. 20 sec.), 1½ miles at 1 in 132 being breasted at a rate which rose to 42 m.p.h. at the top, 61½ m.p.h. being reached on the subsequent easy length past Mellis, and the lowest rate on the 1 in 248 past Finningham being 56½ m.p.h. A tremendous burst of speed through Haughley, with a maximum of 75 m.p.h., brought us into Stowmarket, 6 miles from Finningham, in 6¼ min., despite a slight signal check and a very slow stop; from Diss the time for the 14·4 miles over Finningham Summit was 17 min. 35 sec., or about 17¼ min. net, although allowed 19 min. Getting away from Stowmarket 10 min. late, we did some galloping on to Ipswich over the ensuing easy length, reaching 65 m.p.h. at Bramford; Needham, 3·5 miles, was passed in 5½ min., and East Suffolk Junction, 11 miles, in 12 min. 40 sec., Ipswich, 11·9 miles, being reached in 14 min. 25 sec., although the schedule is 16 min. By smart station work at Ipswich, again, the arrival 8½ min. late was converted to a departure only 5½ min. late. So 9½ min. of the late start had now been recovered, and I only wish Simmons had been remaining at the head of the train, as I am sure he would have wiped the last 5½ min. from the 91 min. allowance on to London. As it was, he deserved all credit for a really "sporting" gain of 5¼ min. to engine on quite a smartly-timed express.

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Rail Transport of Round Timber.

AN article published in the April, 1922, RAILWAY MAGAZINE on "Transporting Trees," attracted considerable attention, and was reprinted by arrangement in the April 29 issue of the *Timber Trades Journal and Saw Mill Advertiser*. In the June 24 number of our contemporary a supplementary article was published, dealing with methods adopted by the Midland Railway for dealing with large trees and round timber, and by the courtesy of our contemporary part of this article is now reproduced as constituting a valuable supplement to that previously given.

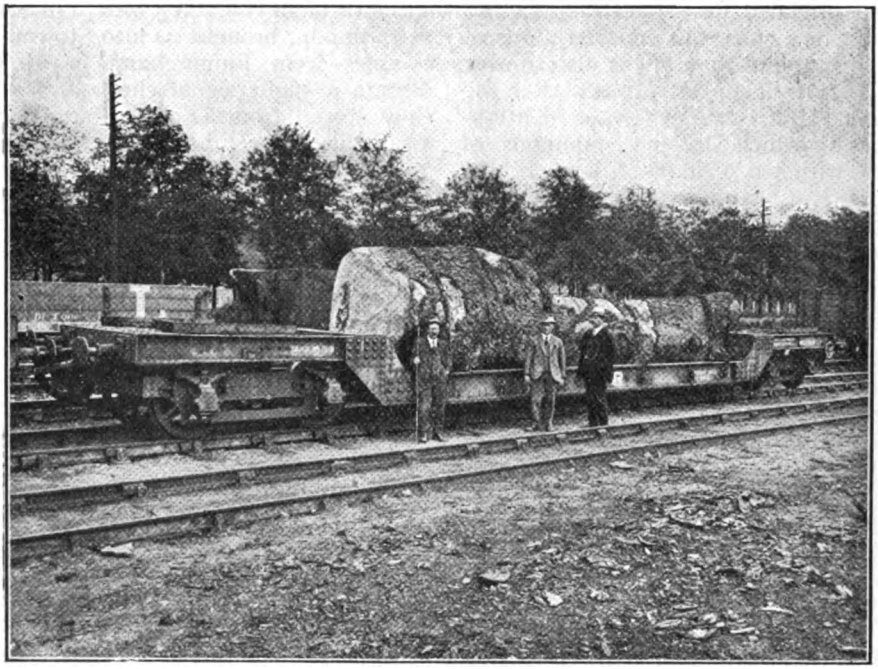

FIG. 1.—HUGE BUTT OF TIMBER, 16 TONS MACHINE WEIGHT, LOADED ON 20-TON LOW TROLLEY.

Whilst short single bolster wagons and ordinary cranes are very useful for dealing with trees of normal size, the experience of the Midland Company is that for trees of exceptional lengths and dimensions far better results are obtained if the traffic is loaded on to special long types of bolster wagons by the aid of steam cranes.

Safety is of paramount importance in loading round timber, as an uneven load or one which is not correctly taking bearings on the setts of single bolster wagons, or, may be, is inadequately or irregularly secured, would soon result in misplacement of the timber with the grave risk of accident arising.

It will, therefore, be appreciated that if for long and heavy pieces of timber a vehicle constructed on the "bogie" principle can be utilised, on which the load is self-contained, the possibility of danger is greatly reduced compared with the use of a number of single bolster wagons to form a sett for the traffic, and particularly is this the case where on sections of the railway the curves are sharp, thus creating a tendency for loads to become displaced; further, if the binding of the loads, whether to the bolsters of the setts of single wagons, or free of the wagons, as the circumstances demand, is not performed with the greatest degree of care and accuracy the single bolster trucks may soon be thrown off the rails when in transit.

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To load exceptionally long and heavy trees with ordinary cranes on to setts of single bolster wagons is, moreover, a laborious process, and during recent years much experimental work has been conducted by the Midland Company, on whose system a considerable quantity of this traffic is dealt with, in order to obtain the best organisation possible for handling big trees.

At the same time the question of the costs to the railway company in dealing with round timber has to be kept under constant review, having regard to the eight hours' day and increased wages for labour, and from this standpoint it is essential for the business to be conducted on the most up-to-date and economical lines which can be devised.

To meet the conditions and requirements generally a system has been adopted by the Midland Company of using powerful steam cranes for handling heavy and lengthy parcels of round timber, and they have built a considerable number of special 25 and 30-ton bolster wagons of the " bogie " type for accommodating such traffic.

It will be of interest to our readers to know that the Midland Company has recently been called upon to deal with some enormous trees at their Worcester Goods Depôt, on behalf of Wood and Glover, of that city, the trees consisting of the renowned " Worcester " elms, and photographs have been specially taken to illustrate what are considered by that company to be the most efficient methods for dealing with traffic of this character.

All the trees shown in the three photographs, which we reproduce, were loaded with the aid of a powerful steam crane in the short space of three hours.

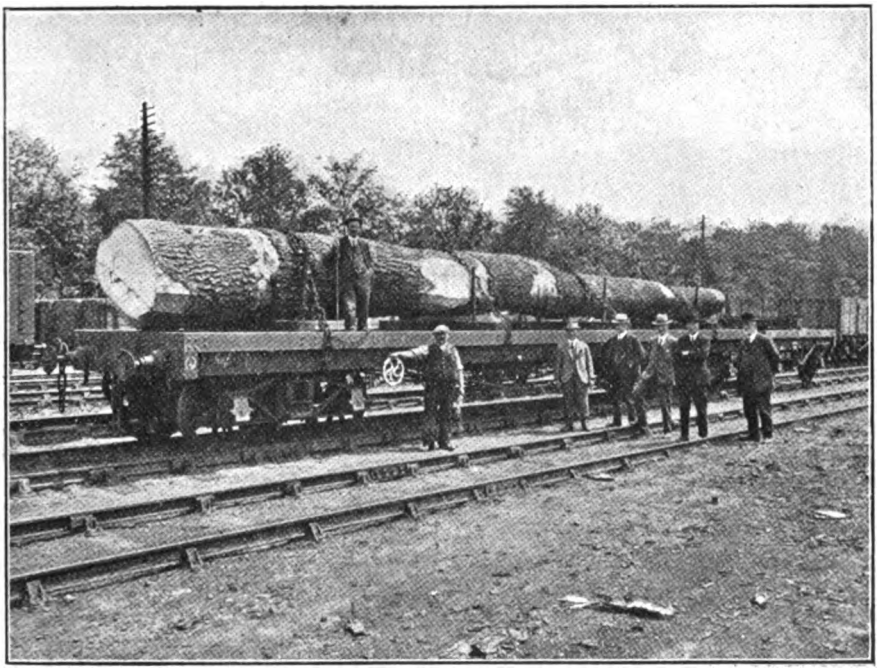

FIG. 2.—TWELVE TONS OF ROUND TIMBER LOADED ON BOGIE BOLSTER WAGON.

Fig. 1 shows a huge butt, cut off a tree containing approximately 1,000 cu. ft., the circumference of the log exceeding 20 ft., the machine weight being 16 tons. The vehicle used in this particular instance is a 20-ton low trolley.

Figs. 2 and 3 show much longer pieces of round timber, the single tree in the second illustration weighing about 12 tons. These two photographs will indicate the superiority of the specially constructed bogie type of bolster wagon over single

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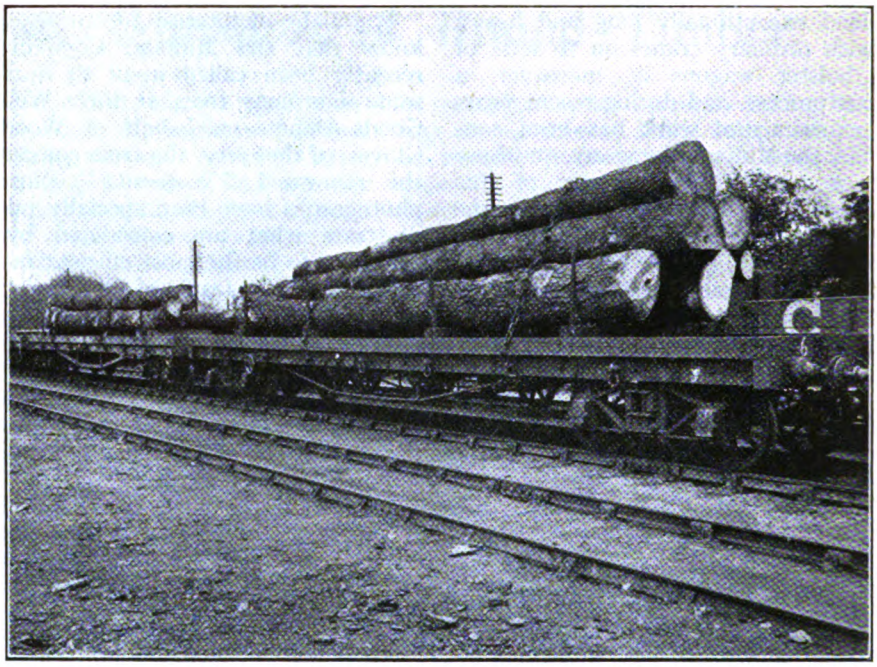
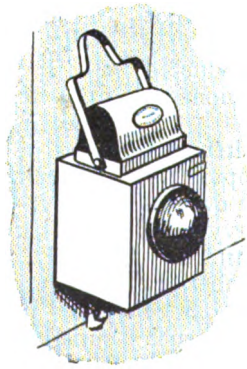


FIG. 3.—ROUND TIMBER OF GOOD LENGTHS AND DIMENSIONS LOADED ON 30-TON BOLSTER WAGONS.

bolster wagons used in setts for such traffic. The bogie timber trucks shown have a carrying capacity of 30 tons each, and if the loads had been placed on single bolster wagons it would have been necessary for 16 of the latter to be used for the conveyance of the trees.

These specially constructed high capacity bogie bolster trucks are extremely useful vehicles, not only for round timber, but for many other articles of exceptional weight and dimensions, and this class of stock is regarded by the Midland Company as much more satisfactory in all respects for traffic of the description indicated than single bolster wagons used in setts.



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British Express Trains in the Summer of 1922.

AN ANALYSIS OF FASTEST AND LONGEST RUNS, RESTAURANT, PULLMAN AND SLEEPING CAR SERVICES, AND SLIP COACHES.

By "VOYAGEUR."

IT is a somewhat melancholy reflection that this is probably the last occasion on which the data, tabulated and commented upon in the present article, will appear in the form to which readers have by now become so well accustomed. Next year British railways, with all their distinctive features and their individuality of character—the subject of fervent partisanships among their admirers to an extent that has no parallel the world over—will have become absorbed, one and all, into four "vast, soulless corporations." Competition, save in certain limited areas which form points of contact between groups—as compared with the widespread areas which now represent contact between individual companies—will have become as dead as the Dodo. One line alone will remain as a recognisable entity, and that is the Great Western—most distinctive, perhaps, of all British lines in its character for enterprise, and certainly the centre of the keenest partisanship of any. Consequently, the tables which follow are likely to become the merest shadows of their present bulky selves, and their fascination must of necessity shrink in the same proportion. Be that as it may—and conceivably new and unexpected interests may arise to take the place of the old—we must endeavour to make the best we can of the fare provided for us in the summer services of 1922.

We start off, as usual, with the fastest times in operation between London and the principal centres of population, or favourite holiday centres, in the provinces. As mentioned on previous occasions, to take the fastest times is not altogether the most satisfactory method, as certain services which in pre-war times boasted one or two exceedingly fast non-stopping expresses, now include a number of trains, on standard end-to-end schedules admitting of an intermediate stop or two, whose fastest time is inferior to that of pre-war days, but whose average journey time may actually be superior to the best that was offered in 1914 or earlier. Take the case of Bournemouth, for example. In 1914 the 12 principal trains between Waterloo and Bournemouth Central averaged 2 hr. 26½ min. on the journeys, but the best in each direction took exactly 2 hr.; to-day the average has dropped to 2 hr. 16 min., and yet 2¼ hr.—the schedule of 11 of the 12 expresses—is the minimum time. On the Great Northern Railway, again, comparison between the 1914 and 1922 King's Cross to Leeds, Bradford and West Riding times is not helped by the fact that in the former year there was a famous "flier" running, which covered the 175¾ miles from Wakefield to King's Cross without intermediate stop in 185 min., and which was, therefore, considerably faster than any other train on the service. This 2 p.m. up express from Leeds to London has not been restored, and at present only one Great Northern Railway express on the Leeds service—the 10 a.m. up—manages to cut below the "standard" time of 4 hr., and that by a mere 5 min. Short of this restoration, however, it would seem that there is room for a material acceleration of the Great Northern services generally, that company being still right at the bottom of percentage figures in regard to restoration of services.

Based on the figures given in Table A, the ultimate slowing of train services

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TABLE A.—FASTEST TIMES BETWEEN LONDON AND PROVINCIAL TOWNS IN 1914, 1918 AND 1922.

Town.	Distance from London.	Fastest time, Aug., 1922.	Railway.	Direction.	Fastest times.		Increase, 1914–1918.		Increase, 1914–1922.	
					July, 1914.	Oct., 1918.				
	Miles.	h. m.			h. m.	h. m.	h. m.	p.c.	h. m.	p.c.
Aberdeen ..	523	11.52(*a*)	East Coast Rlys.	Down	11.05	13.30	2.25	21.8	0.47	7.1
,, ..	540	12.05(*c*)	West Coast Rlys.	,,	11.15	N.S.	—	—	0.50	6.7
Birmingham	110½	2.00	G.W.R.	Both	2.00	2.30	0.30	25.0	Nil	0.0
,, ..	113	2.00	L. & N.W.R. ..	,,	2.00	2.30	0.30	25.0	Nil	0.0
Bournemouth	108	2.15	L. & S.W.R. ..	,,	2.00	2.35	0.35	29.2	0.15	12.5
Bradford ..	193¼	4.15	G.N.R.	,,	3.56	4.50	0.54	22.9	0.19	8.0
,, ..	203½	4.42	Mid. & L.N.W. Rlys.	Up	4.13	5.55	1.42	40.3	0.29	11.5
,, ..	208	4.54	G.C. & L.N.W. Rlys.	Down	4.42	5.00	0.18	6.4	0.12	4.3
Brighton ..	51	1.00	L.B. & S.C.R. ..	Both	1.00	1.15	0.15	25.0	Nil	0.0
Bristol ..	118½	2.00	G.W.R.	,,	2.00	2.15	0.15	12.5	Nil	0.0
Cambridge ..	56	1.14(*e*)	G.E.R.	Down	1.11	1.19	0.08	10.3	0.03	4.2
Cardiff ..	145¼	2.52	G.W.R.	Up	2.50	3.10	0.20	11.8	0.02	1.2
Carlisle ..	299	5.58	L. & N.W.R. ..	Down	5.48	6.45	0.57	16.4	0.10	2.8
,, ..	309	6.23	Midland R. ..	,,	6.05	7.28	1.23	22.5	0.18	4.9
Edinburgh ..	393	8.25(*b*)	East Coast Rlys.	,,	7.45	9.40	1.55	24.7	0.40	8.6
,, ..	400	8.30	West Coast Rlys.	Both	8.00	N.S.	—	—	0.30	6.2
,, ..	407¼	9.11	Mid. & N.B. Rlys.	Down	8.40	10.44	2.04	23.8	0.31	6.0
Eastbourne..	65¾	1.30	L.B. & S.C.R. ..	Both	1.25	1.42	0.17	20.0	0.05	5.9
Exeter ..	173¾	2.59(*d*)	G.W.R.	Up	3.00	3.30	0.30	14.3	−0.01	−0.6
,, ..	171¾	3.20	L. & S.W.R. ..	Both	3.14	3.57	0.40	20.6	0.06	3.1
Folkestone ..	70	1.20	S.E. & C.R. ..	,,	1.23*	2.00*	0.37	44.6	−0.03	−3.6
Glasgow ..	401½	8.25(*b*)	West Coast Rlys.	Down	8.00	9.30	1.30	18.7	0.25	5.2
,, ..	424½	9.05	M. & G. & S.W. Rlys.	Up	8.45	10.40	1.55	21.9	0.20	3.8
,, ..	440¼	9.45	East Coast Rlys.	Down	9.20	N.S.	—	—	0.25	4.5
Harrogate ..	198¾	4.25(*g*)	G.N.R.	Both	4.00	5.20	1.20	33.3	0.25	6.2
,, ..	214¼	4.50	Midland R. ..	Up	4.30	6.05	1.35	35.2	0.20	7.4
Hastings ..	62¼	1.30	S.E. & C.R. ..	Down	1.30*	1.54*	0.24	26.7	Nil	0.0
Huddersfield	191¼	4.12	G.C. & L.N.W. Rlys.	,,	4.09	4.27	0.18	7.2	0.03	1.2
,, ..	208¾	4.18	L. & N.W.R. ..	,,	4.35	N.S.	—	—	−0.17	−6.2
,, ..	190¾	4.25(*h*)	G.N.R.	Up	4.02	5.12	1.10	29.0	0.23	9.5
,, ..	196½	4.41(*k*)	Mid. & L.N.W.	Down	4.10	N.S.	—	—	0.31	12.4
Hull ..	196¾	4.22	G.N. &:N.E. Rlys.	,,	3.52	4.55	1.03	27.2	0.30	12.9
Inverness ..	567¾	13.55	West Coast Rlys.	,,	13.08	15.55	2.47	21.2	0.47	6.0
,, ..	558¾	13.55	East Coast Rlys.	,,	12.53	N.S.	—	—	1.02	8.0
Leeds ..	196	3.55	Midland R. ..	Both	3.40	4.47	1.07	30.4	0.15	6.8
,, ..	185¾	3.55	G.N.R.	Up	3.25	4.32	1.07	32.7	0.30	14.6
Leicester ..	99	1.47	Midland R. ..	Down	1.45	2.15	0.30	28.6	0.02	1.9
,, ..	103	1.49	G.C.R. ..	,,	1.49	1.56	0.07	6.4	Nil	0.0
Liverpool ..	192¼	4.00	L. & N.W.R. ..	Both	3.35	4.45	1.10	32.6	0.25	11.6
Manchester	189½	3.56(*f*)	Midland R. ..	,,	3.40	5.08	1.28	40.0	0.16	6.8
,, ..	188½	3.58(*f*)	L. & N.W.R. ..	Up	3.30	4.35	1.05	31.0	0.28	13.3
,, ..	212	4.25	G.C.R. ..	Both	4.10	4.45	0.35	14.0	0.15	6.0
Margate ..	74	1.30	S.E. & C.R. ..	,,	1.30	2.03	0.33	36.7	Nil	0.0
Newcastle ..	268½	5.34	G.N. & N.E. Rlys.	Down	5.13	5.55	0.42	13.4	0.21	6.7
Norwich ..	115	2.34	G.E.R.	,,	2.26	2.54	0.28	19.2	0.08	5.5
Nottingham	123½	2.15	Midland R. ..	,,	2.15	2.55	0.40	29.6	Nil	0.0
,, ..	120½	2.16	G.C.R.	,,	2.23	2.27	0.04	2.8	−0.07	−4.9

(*a*) Advertised time, 12 h. (*b*) Advertised time, 8½ h. (*c*) Advertised time, 12 h. 10 m.
(*d*) Advertised time, 3 h. (*e*) From St. Pancras, 1922 and 1914.
(*f*) Advertised time, 4 h. (*g*) Via Church Fenton.
(*h*) Via Wakefield, Kirkgate and Westgate. (*k*) Via Thornhill.
* From Cannon Street, 1¼ m. less, 1914 and 1918.
(N.S.) No through service or bookings.

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TABLE A.—FASTEST TIMES BETWEEN LONDON AND PROVINCIAL TOWNS IN 1914, 1918 AND 1922—*Continued.*

Town.	Distance from London.	Fastest time, Aug., 1922.	Railway.	Direction.	Fastest times.		Increase, 1914–1918.		Increase, 1914–1922.	
					July, 1914.	Oct., 1918.				
	Miles.	h. m.			h. m.	h. m.	h. m.	p.c.	h. m.	p.c.
Parkeston Q.	69	1.22	G.E.R.	Down	1.22	2.04	0.42	50.1	Nil	0.0
Penzance ..	305¼	6.30	G.W.R.	,,	6.35	7.55	1.20	20.3	−0.05	−1.3
Perth ..	449¾	9.35	West Coast Rlys.	,,	9.00	11.05	2.05	23.1	0.35	6.5
,, ..	440¾	9.40	East Coast Rlys.	,,	8.58	N.S.	—	—	0.42	7.8
Peterborough	76½	1.24	G.N.R.	Up	1.21	1.42	0.21	25.9	0.03	3.7
Plymouth ..	225¾	4.07	G.W.R.	Down	4.07	5.00	0.53	21.5	Nil	0.0
Portsmouth Town	85¾	1.55	L.B. & S.C.R. ..	,,	1.58	2.38	0.40	33.9	−0.03	−2.6
,,	73¾	1.57	L. & S.W.R. ..	Up	1.51	2.12	0.21	18.9	0.06	5.4
Sheffield ..	164¾	3.06	G.C.R.	Down	2.57	3.22	0.25	14.1	0.09	5.1
,, ..	158¼	3.14	Midland R. ..	Up	3.02	4.01	0.59	32.4	0.12	6.6
Southampton	79½	1.32	L. & S.W.R. ..	Both	1.38	1.43	0.05	5.1	−0.06	−6.1
Stoke ..	145½	2.50	L. & N.W.R. ..	Up	2.41	3.21	0.40	23.5	0.09	5.3
York ..	188	3.47	G.N.R.	,,	3.35	4.00	0.25	11.6	0.12	5.6

(N.S.) No through service or bookings.

which had taken place at the time of the Armistice, as compared with the times offered in the summer of 1914, was as follows :—

	Per cent.	Minutes per hour.
Great Central Railway ..	8·5	5
Great Western Railway ..	17·6	10½
London & South Western Railway	18·5	11
East Coast Railways ..	20·0	12
West Coast Railways ..	21·0	12½
London & North Western Railway	25·7	15¼
Great Northern Railway ..	26·1	15½
London, Brighton & South Coast Railway	26·3	15¾
Great Eastern Railway ..	26·5	16
Midland Railway	30·5	18¼
South Eastern & Chatham Railway	36·0	21½

The general average works out at 23·14 per cent., or all but 14 min. per hour of travelling time—a figure of which it is somewhat difficult to realise the moderation, when we remember the utter tedium of war-time journeys. By the summer of 1920 this had come down to 13·6 per cent., and 1921 saw a further reduction to 8·6 per cent.; then came the radical accelerations of last October, which brought the average down further to 4·6 per cent. This summer the figure is 4·32 per cent. only in excess of best pre-war times, or 2½ min. per hour, divided up between the various companies as follows :—

	Per cent.	Minutes per hour.
South Eastern & Chatham Railway	−1·2	−0¾
Great Western Railway ..	−0·1	0
London, Brighton & South Coast Railway	1·1	0¾
Great Central Railway ..	1·9	1½
Great Eastern Railway ..	3·2	2
London & South Western Railway	3·7	2¼
London & North Western Railway	5·4	3¼
West Coast Railways ..	6·1	3½
Midland Railway	6·2	3¾
East Coast Railways ..	7·1	4¼
Great Northern Railway ..	8·5	5

It will be noticed that the percentage figures do not show up quite so well in the case of some companies as they did in October last, but this is because a summer comparison is more severe on present services than a winter one, in view of one or two " crack " pre-war expresses which ran on certain lines during the summer months only, and have never been reinstated.

Of the 60 services shown in the table, those to or from Exeter (Great Western Railway), Folkestone, Huddersfield (London & North Western), Nottingham (Great Central Railway), Penzance, Portsmouth Town (London, Brighton & South

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TABLE B.—RUNS OF 100 MILES OR OVER PERFORMED WITHOUT INTERMEDIATE STOPPAGE.

‖Railway— Runs between	Distance.	No. of Runs.	Fastest			Total No. of Runs Daily.		
			Time.	Train.	Speed.	1914.	1918.	1922.
	Miles.		Min.		m.p.h.			
L. & N.W.R. (209.1) ..	—	—	—	—	—	41	10	34
Euston—Chester	179.2	0+1§	213	8.45 p.m. D.	50.5			
Euston—Wilmslow ..	176.9	1	196	6.30 p.m. D.	54.2			
Prestatyn—Bletchley ..	158.8	1	185	12.53 p.m. U.	51.5			
Euston—Crewe	158.1	7+3‡	175	11.00 p.m. D.	54.2			
Camden—Crewe	156.5	1 (x)	255	9.35 p.m. D.	36.8			
Crewe—Willesden Jc. ..	152.7	1	174	3.41 a.m. U.	52.7			
Crewe—Carlisle	141.0	8+1§	163	1.15 p.m. D.	51.9			
Stoke—Willesden Jc. ..	140.5	1	157	1.15 p.m. U.	53.7			
Euston—Stafford	133.6	5	147	11.00 a.m. D.	54.5			
Stafford—Holyhead ..	130.1	0+1¶	168	9.30 p.m. D.	46.5			
Euston—Birmingham ..	112.9	6	120	6 trains D. & U.	56.5			
Edge Hill—Rugby	109.7	1 (x)	211	5.37 p.m. U.	31.2			
Birmingham—Willesden Jc.	107.5	1	109	4.50 p.m. U.	59.2			
Wigan—Carlisle	105.2	1+1¶	130	12.04 a.m. D.	48.6			
Birmingham—Prestatyn ..	100.7	0+1*	143	12.55 p.m. D.	42.3			
G.W.R. (225.7)	—	—	—	—	—	33	6	26
Paddington—Plymouth (*a*)	225.7	1	247	10.30 a.m. D.	54.8			
Paddington—Torquay ..	199.7	2	215	12.00 noon D. 12.10 p.m. U.	55.7			
Paddington—Exeter ..	173.7	2	179	1.46 p.m. U.	58.2			
Reading—Newton Abbot ..	157.9	0+2¶	185	9.08 a.m. D.	51.2			
Paddington—Taunton ..	142.9	2	150	11.00 a.m. U. 6.28 p.m. U.	57.2			
Exeter—Reading	137.7	1+3¶	145	1.25 p.m. U.	57.0			
Paddington—Newport ..	133.4	5	153(*e*)	3.35 p.m. D.	52.3			
Paddington—Worcester ..	120.5	1	130	1.30 p.m. D.	55.6			
Shrewsbury—Pylle Hill Jc. (*b*)	120.5	0+1¶	197	11.08 p.m. D.	36.7			
Ealing—Wolverhampton ..	118.7	0+2*	132	10.26 a.m. D.	54.0			
Paddington—Bristol (*c*) ..	118.3	2	120	11.15 a.m. D. 1.00 p.m. D.	59.2			
Bristol—Paddington (*d*) ..	117.6	2	120	12.00 noon U. 5.00 p.m. U.	58.8			
Paddington—Birmingham ..	110.6	2+2¶	120	10.40 a.m. D. 2.20 p.m. D.	55.3			
Paddington—Bath	106.9	3+2†	105†	11.15 a.m. D.† 1.00 p.m. D.†	61.1†			
Reading—Taunton ..	106.9	1+3¶	115(*f*)	2.49 p.m. D.	55.8			
Ealing—Birmingham ..	106.3	2††	114	10.26 a.m. D.	56.0			
Newton Abbot—Trowbridge	102.3	0+1¶	123	1.02 p.m. U.	49.9			
G.N.R. (175.7)	—	—	—	—	—	22	6	18
King's Cross—Doncaster ..	156.0	3	176	5.30 p.m. D.	53.2			
King's Cross—Grantham ..	105.5	13	120	5.37 p.m. D. 8.00 p.m. U.	52.8			
Grantham—Finsbury Park	103.0	2 (x)	129	10.11 p.m. U.	47.9			

‖ Figures in brackets in this column indicate longest run (miles) in 1914.

(x) Fish, meat or milk trains, not conveying passengers. † By slip carriage.

(*a*) North Road Station; (*b*) Bristol; (*c*) *via* Bath; (*d*) *via* Badminton; (*e*) faster service in 152 min. by 8.45 a.m. D., stopping 4 min. at Reading; (*f*) Faster service by slip coach off 11.00 a.m. U. in 113 min.; D. Down; U. Up.

Notes as to additional runs not made daily (not included in totals)—

* Saturdays only. ‡ Two additional runs on Mondays only, one on Fridays only, three on Saturdays only. †† Not on Saturdays (included in totals).

§ Conditional timings, frequently used. ¶ Excursion trains, Fridays or Saturdays only.

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TABLE B.—RUNS OF 100 MILES OR OVER PERFORMED WITHOUT INTERMEDIATE STOPPAGE—*Continued.*

‖Railway— Runs between	Distance.	No. of Runs.	Fastest			Total No. of Runs Daily.		
			Time.	Train.	Speed.	1914.	1918.	1922.
	Miles.		Min.		m.p.h.			
Midland R. (206.0)	—	—	—	—	—	15	—	9
St. Pancras—Nottingham ..	123.5	3	135	9.00 a.m. D. 1.50 p.m. D. 5.00 p.m. D.	54.9			
St. Pancras—Trent Jc. ..	119.8	2	130	5.40 a.m. U.	55.3			
Leeds—Carlisle	113.0	4	135	3.53 a.m. D. 4.07 p.m. D.	50.2			
N.E.R. (124.4)	—	—	—	—	—	8	3	9
Newcastle—Edinburgh ..	124.4	7	147	11.18 a.m. D.	50.8			
Doncaster—Newcastle ..	112.4	1	146	1.03 p.m. D.	46.2			
Drem Jc.—Newcastle ..	106.6	1 (*k*)	135	1.55 p.m. U.	47.4			
G.E.R. (130.2)	—	—	—	—	—	7	—	6
Liverpool St.—N. Walsham	130.2	2	165	12.25 p.m. D. 1.10 p.m. U.	47.3			
Liverpool St.—Yarmouth..	121.8	2	160	1.25 p.m. U.	45.7			
Liverpool St.—Beccles ..	109.2	2	146	9.55 a.m. D.	44.9			
G.C.R. (164.7)..	—	—	—	—	—	4	2	5
Marylebone—Leicester (*g*)..	107.6	1	114	6.20 p.m. D.	56.6			
Marylebone—Leicester (*h*)..	103.1	4	109	3.20 p.m. D.	56.8			
Caledonian R. (111.0) ..	—	—	—	—	—	4	—	4
Carlisle—Glasgow	102.3	3(*l*)	134	10.00 a.m. U.	45.8			
Edinburgh—Carlisle ..	100.6	1	120	10.00 a.m. U.	50.3			
L. & S.W.R. (108.0)	—	—	—	—	—	4	—	—
Totals	—	—	—	—	—	138	27	111

‖ Figures in brackets in this column indicate longest run (miles) in 1914. D. Down. U. Up. (*g*) *via* Wycombe; (*h*) *via* Aylesbury; (*k*) Includes conditional stop at Dunbar; (*l*) Includes conditional stop at Motherwell on two runs.

TABLE C.—LONGEST DAILY NON-STOP RUNS IN AUGUST, 1922, ON RAILWAYS HAVING RUNS EXCEEDING 50 MILES BUT NO RUNS EXCEEDING 100 MILES.

Railway.	Runs between	Distance.	No. of runs.	Fastest time.	Fastest train.	Speed.	Longest run in Aug. 1914
		miles.		min.		m.p.h.	miles.
G. & S.W.R...	Kilmarnock–Carlisle	91.1	1	111	11.24 p.m. U.	49.2	91.1
L. & S.W.R...	Salisbury–Exeter ..	88.0	4	102	12.30 p.m. U.	51.8	108.0
L.B. & S.C.R.	Victoria–Fratton ..	84.4	2	110	*11.35 a.m. D.	46.0	84.4
S.E. & C.R. ..	Victoria–Dover Marine	78.0	10	103	†10.50 a.m. D.	45.4	78.0
N.B.R. ..	Edinburgh–Dundee..	59.2	3	79	4.12 a.m. D.	45.0	98.2
G.N.R. (I) ..	Dublin–Dundalk ..	54.3	2	63	6.35 p.m. D.	51.7	33.3
G.S.&W.R. (I)	Maryborough–Dublin	51.0	1	63	5.37 p.m. U.	48.6	86.8
M.G.W.R. (I)	Dublin–Mullingar ..	50.0	6	74	6.6 p.m. U.	40.5	50.0

* And at 1.35 p.m. D. † And at 11.0 a.m. and 2.0 p.m. D.

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Coast Railway), and Southampton, seven in number, are slightly faster than in pre-war days, and 10 others—Birmingham by both routes, Brighton, Bristol, Hastings, Leicester (Great Central Railway), Margate, Nottingham (Midland), Parkeston Quay and Plymouth (Great Western Railway)—are now equal to their pre-war times. The South Eastern & Chatham figures would be even better than they are were it not that the best pre-war services to and from Folkestone and Hastings were given from Cannon Street, instead of, as are kept waiting there and are then allowed to dawdle unconscionably over the remaining 11½ miles to London Road, lest they should infringe the agreed four hours' "minimum" time from town.

It will be noticed that Huddersfield has been inserted in this table, to illustrate the new and feverish competition which has recently been reawakened between London and the West Riding towns, and in which the London & North Western Railway has risen to an important place. The Great Northern service, once so good, has

TABLE D.—FASTEST RUNS ON LEADING RAILWAYS IN 1914 AND 1922.

Railway.	In August, 1922.						(*a*) In 1914.
	Train.	From—	To—	Miles.	Min.	Speed. m.p.h.	Speed. m.p.h.
N.E.R. ..	8.59 p.m. ..	Darlington ..	York ..	44·1	43	61·5	61·5
G.C.R. ..	4.30 a.m. ..	Leicester ..	Arkwright St.	22·6	22	61·5	61·5
G.W.R. ..	11.15 a.m. (*b*)	Paddington	Bath ..	106·9	105	61·1	61·1
L. & N.W.R.	1.00 p.m. (*c*)	Birmingham	Coventry ..	18·9	19	59·7	57·7
Caledonian R.	4.43 p.m. ..	Forfar ..	Perth ..	32·5	34	57·4	57·4
S.E. & C.R. ..	6.00 p.m. ..	Tonbridge ..	Ashford ..	26·5	28	56·8	54·8
Midland R. ..	5.53 p.m. ..	Kettering ..	St. Pancras..	72·0	77	56·1	56·8
G.N.R. ..	7.41 p.m.(*d*)	Grantham ..	Doncaster ..	50·5	55	55·1	57·5
L. & S.W.R.	5.25 p.m. ..	Basingstoke	Surbiton ..	35·8	39	55·1	57·2
G.N.R. (I) ..	6.45 a.m. ..	Dublin ..	Drogheda ..	31·8	36	53·0	50·0
L.B. & S.C.R.	6.35 p.m. (*e*)	Brighton ..	E. Croydon ..	40·3	46	52·6	51·0
C.L.C. ..	14 trains ..	Manchester..	Warrington ..	15·7	18	52·3	52·3
N.B.R. ..	9.42 p.m. (*f*)	Cowlairs ..	Edinburgh ..	45·8	53	51·9	52·3
G.E.R. ..	10.19 p.m. ..	Shenfield ..	Prittlewell ..	20·7	24	51·8	52·9
G. & S.W.R.	5.10 p.m. (*g*)	Glasgow ..	Ayr	41·4	50	49·7	54·6
G.S. & W.R.(I)	5.37 p.m. ..	Maryborough	Dublin ..	51·0	63	48·6	51·9
G.N.S.R. ..	11.20 a.m. ..	Huntly ..	Schoolhill (*h*)	40·4	51	47·5	43·8
N.S.R. ..	12.43 p.m. ..	Macclesfield	Stoke ..	19·8	27	44·0	44·0
Highland R. ..	6.25 p.m. ..	Blair Atholl	Perth ..	35·3	50	42·3	41·5

(*a*) Generally, but not in all cases, over the same route.
(*b*) And at 1.00 p.m.; by slip coach in both cases.
(*c*) And at 6.20 p.m. (*d*) And at 7.57 p.m. (*e*) Sundays only.
(*f*) From *conditional* stop, when made. (*g*) And at 8.25 a.m. Ayr to Glasgow.
(*h*) Aberdeen ticket platform.

at present, from Charing Cross—some 1¼ miles and 3 min. further in journey time; notwithstanding this, they are noteworthy enough to bring that company from the bottom of the percentages in 1918 to the very top in 1922. Similarly, the London & North Western Railway ought to show a much better Manchester figure, were it not for the tragedy of the 10.30 a.m. and 6.30 p.m. down expresses from Euston, whose times to Wilmslow are equivalent to journeys of a shade over 3½ and 3¾ hours to Manchester, but which now fallen to an even poorer level than the table indicates, seeing that the service shown, which involves changes at both Kirkgate and Westgate stations at Wakefield (to connect with the 10 a.m. ex Leeds), with very tight margins of time, is one of doubtful certainty, and all other connections are considerably slower. Differences indicated between working and advertised times are due to the fact that the Aberdeen portion of the 7.30 p.m. ex King's Cross leaves at 7.38 p.m.; the 9.50 a.m. ex King's Cross arrives at Edinburgh at

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6.15 p.m., and the 10 a.m. from Euston at Glasgow at 6.25 p.m.; the up "Riviera" express on the Great Western Railway has been altered to leave Exeter at 1.46 instead of 1.45 p.m.; the 2.25 p.m. from St. Pancras to Manchester is really due at 6.21 p.m., and the 8.10 a.m. from Manchester (and Liverpool) to Euston is booked in at 12.8 p.m. Here I must leave Table A, although plenty more might be said about it, did space permit.

Table B introduces us to the daily non-stop runs exceeding 100 miles in length. The 78 runs of last summer, and the 83 of October, now give place to no less than 111 daily, or 80 per cent. of the pre-war total. This is a remarkably fine figure, especially in view of the difficulties at present occasioned by the eight hours' day, which were never known in pre-war times. The totals are strictly confined to runs which are made on every week-day, although for the information of readers I have also included in the tables the journeys of excursion and other conditional trains which run frequently enough to find a place throughout the season in the working time-tables. Some remarkable fare is once again being provided for the excursionist, such runs as Shrewsbury-

TABLE E.—RESTAURANT AND PULLMAN CAR TRAINS IN 1914, 1918 AND 1922.

Railway.	Restaurant car trains, 1922.			¶ Tea Car Trains, 1922.	Pullman Car Trains, 1922.	Totals.		
	Worked.	Jointly Worked.	Worked by foreign railways.			July, 1914.	Oct., 1918.	Aug., 1922.
G.W.R.	71	—	13	12	—	88	—	96
L. & N.W.R.§	64	13	9	7	—	98	2	93
G.E.R.	44	—	3	—	27	35	4	†64
L.B. & S.C.R.	—	—	4	—	54	44	20	58
Midland R.	47	8	—	—	—	64	20	55
Caledonian R.	—	13	8	—	‡34	31	—	55
L. & S.W.R.	38	—	6	8	—	36	12	52
N.E.R.	10	10	22	—	—	32	—	42
S.E. & C.R.	—	—	4	—	30	17	—	34
N.B.R.	17	10	3	—	—	40	—	30
G.N.R.	19	10	—	—	—	34	—	29
G.C.R.	20	—	6	—	—	22	8	26
G.N.R. (I)	6	—	—	4	—	4	8	10
G. & S.W.R.	4	4	—	—	—	10	2	8
Metropolitan R. ..	—	—	—	—	8	10	—	8
G.S. & W.R. (I) ..	4	—	—	—	—	6	—	4
D. & S.E.R. (I.) ..	2	—	2	—	—	4	—	4
Highland R.	—	—	4	—	—	—	—	4
M.G.W.R. (I.) ..	2	—	—	—	—	3	—	2
G.N.S.R.	2	—	—	—	—	—	—	2
N.C.C. (I.)	—	—	—	—	—	2	—	—
* Grand totals ..	350	32	—	31	153	475	72	556

NOTE.—Joint lines regarded as forming portions of parent systems.

* These totals do not include the same cars more than once when they run over more than one system.

† Totals reduced by 10 in that 10 trains carry both Pullman and restaurant cars in their formations.

‡ Includes 18 restaurant car services, first and third-class, operated by Pullman Company (without supplementary seat charge).

§ Includes Lancashire and Yorkshire Railway services.

¶ Trains in which teas are served from a small compartment buffet and not in a restaurant car.

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Bristol, Reading-Newton Abbot, and Stafford-Holyhead being distinctly out of the ordinary run of things. Another curious excursion run is that from Newton Abbot to Trowbridge; the train in question is sandwiched in between the 9.50 a.m. from Truro and the up "Riviera," and manages with some effort to keep ahead of the latter as far as Westbury, where it thankfully hurries out of the way of the famous "flier," and stops, quite exhausted, at Trowbridge to "take breath," proceeding thence to London *via* Chippenham and Reading. The importance of our food

TABLE F.—"FOREIGN" RESTAURANT CAR WORKINGS, AUGUST, 1922.

Railway.	Service.	"Foreign" Car Workings.		No. Daily.
		Between	Owning Companies.	
N.E.R. (22) ..	Newcastle–Bournemouth ..	Newcastle–Mexborough ..	G.C. & L.S.W.	2
	,, Swansea ..	,, ,, ..	G.W. & G.C.R.	2
	Scarborough–Southampton	Scarborough–Mexborough	,,	2
	York–Swindon–Westbury ..	York–Mexborough	G.W.R. ..	1
	Newcastle–Liverpool ..	Newcastle–Normanton ..	L. & N.W.R.	2
	York–Lowestoft	York–Shaftholme Junction	G.E.R. ..	2
	,, Glasgow	,, Berwick	N.B.R. ..	1
	King's Cross–Hull	Thorne Junction–Hull ..	G.N.R. ..	2
	,, Scarborough	Shaftholme–Scarborough ..	,, ..	4
	,, Ripon ..	Knottingley–Ripon	,, ..	1
	,, Harrogate ..	Holbeck–Harrogate † ..	,, ..	3
G.W.R. (13) ..	Liverpool–Plymouth ..	Shrewsbury–Plymouth ..	L. & N.W.R.	3
	Sheffield–Weston	Banbury–Weston	G.C.R. ..	2
	Newcastle–Bournemouth ..	,, Basingstoke ..	G.C. & L.S.W.	2
	Scarborough–Southampton	,, ,, * ..	G.C.R. ..	1
	Birkenhead–Bournemouth ..	Birkenhead–Basingstoke ..	L. & S.W.R. ..	2
	Newcastle–Swansea ..	Banbury–Swansea	G.C.R. ..	1
	York–Swindon–Westbury ..	,, Westbury ..	N.E.R. ..	1
	Cardiff–Brighton	Cardiff–Salisbury	L. & S.W.R. ..	1
L. & N.W.R. (9)	Liverpool–Plymouth ..	Liverpool–Shrewsbury ..	G.W.R. ..	3
	St. Pancras–Bradford ..	Thornhill–Bradford ..	Midland R. ..	2
	Marylebone–Bradford ..	Penistone–Bradford ..	G.C.R. ..	2
	St. Pancras–Manchester ..	Miles Platting–M/c Victoria	Midland R ..	2
L. & S.W.R. (8)	Scarborough–Southampton	Basingstoke–Southants¶ ..	G.W. & G.C.R.	2
	Newcastle–Bournemouth ..	Basingstoke–Bournemouth	G.C.R. ..	1
	Sheffield–Bournemouth ..	Broadstone–Bournemouth	Midland R. ..	2
	Brighton–Cardiff	Portsmouth–Salisbury ..	G.W.R. ..	1
	,, ,, ...	,, Brighton ..	G.W. & L.S.W.	2
Caledonian R. (8)	Edinburgh–Aberdeen ..	Kinnaber Junc.–Aberdeen	N.B.R. ..	8
G.C.R. (6) ...	York–Swindon–Westbury ..	Mexborough–Banbury ..	G.W. & N.E.R.	2
	Newcastle–Bournemouth ..	,, ,, ..	L. & S.W.R. ..	1
	,, Swansea ..	,, ,, ..	G.W.R. ..	1
	Scarborough–Southampton	,, ,, ..	,, ..	1
	Liverpool–Harwich ..	Liverpool–Lincoln	G.E.R. ..	1
L.B. & S.C.R. (4)	Eastbourne–Liverpool ..	Eastbourne–Kensington ..	L. & N.W.R.	2
S.E. & C.R. (4)	Ramsgate–Birmingham ..	Ramsgate–Kensington ..	,, ..	2
	Dover–Birkenhead	Dover–Reading	G.W.R. ..	2
Highland R. (4)	Glasgow–Aviemore ..	Stanley Junct.–Aviemore ..	Caledonian R.	2
	Aberdeen–Inverness ..	Elgin–Inverness	G.N.S.R. ..	2
G.E.R. (3) ..	Liverpool–Harwich ..	Lincoln–Harwich	G.C.R. ..	1
	Manchester–Yarmouth ..	Lincoln–Yarmouth ..	,, ..	2
N.B.R. (3) ..	Leeds–Glasgow	Berwick–Glasgow	N.E.R. ..	2
	York–Glasgow	,, ,, ...	,, ..	1
D. & S.E.R. (2)	Kingstown–Cork	Kingstown–Amiens St. ..	G. & S.W.R.	2

NOTE.—Joint lines regarded as forming portions of parent systems.
* Winchester–Banbury, via Didcot, on North-bound run. † Ripon–Holbeck on one run.
¶ Southampton–Winchester only, on North-bound run.

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supplies may be gauged by the appearance in the table of a down "Perishable" train on the London and North Western Railway from Camden to Crewe and an up "Meat" from Liverpool to Rugby—both regular daily runs—while the Great Northern Railway has two "Express Milk" trains up to London every night, timed at a really substantial speed from Grantham to Finsbury Park.

Long runs which reappear in this table for the first time since the war are Euston-Wilmslow on the London and North Western Railway, Paddington-Torquay on the Great Western Railway, King's Cross-Doncaster on the Great Northern Railway, St. Pancras-Trent Junction on the Midland Railway, Doncaster-Newcastle (after a lapse of many years) on the North Eastern Railway, Liverpool Street-North Walsham and Yarmouth on the Great Eastern Railway, and Edinburgh-Carlisle on the Caledonian Railway. Entirely new "breaks," other than those of the "perishable" and excursion trains already referred to, are the 158·8 miles' Prestatyn-Bletchley journey on the London and North Western Railway, Exeter to Reading as a daily start-to-stop journey on the Great Western Railway, and Drem-Newcastle on the North Eastern Railway. In order to avoid being accused of omissions, I would also mention several apparent 100-mile runs which are really broken into intermediately for working purposes. These include on the London and North Western Railway, the 7.30 p.m. Euston-Crewe and the 9.20 p.m. Euston-Stafford, calling at Rugby at 9.5-9.8 p.m. and 10.54-10.59 p.m. respectively; the 10.45 p.m. Crewe-Carlisle at Preston, 11.46-11.49 p.m.; and the 1.18 a.m. Crewe-Holyhead, at Chester, 1.46-1.48 a.m. Also, on the Caledonian Railway, all apparent 100-mile runs out of Carlisle, other than the one shown, are scheduled to stop at Beattock, for water and assistance to Summit; if the trains are piloted from Carlisle, the stop is often made at Summit instead.

As usual, there are many runs closely approaching in length the 100-mile limit, but just falling short. The Midland are always unfortunate in this respect; there are this summer 17 daily runs over the 99 miles between St. Pancras and Leicester, two between Leicester and Leeds, 97 miles, and one from Manton to St. Pancras, 90½ miles. On the London and North Western there is a Saturdays only journey of 99½ miles from Manchester to Bangor, and a daily run over the 89½ miles from Penmaenmawr to Manchester, not to mention Euston-Nuneaton, 97 miles, two runs (one a parcels train); Crewe-Blisworth, 95¼ miles, 1 run; and Euston-Coventry, 94 miles, 7 runs (one a Newspaper express, in 99 min.). Similarly the Great Western Railway runs between Reading and Newport, 97½ miles (3), Paddington-Westbury, 95½ miles (2 and a slip coach journey), and Paddington-Chippenham, 94 miles (1 and a slip coach journey), deserve mention. This brings us to Table C, containing details of the longest runs made by railways which do not attain to the 100-mile standard, but there are no changes here that require comment.

Important alterations take place in Table D, which details the fastest start-to-stop run scheduled over each railway. Four railways now rise above the level of the fastest journey of last summer—the Caledonian Forfar-Perth run—which takes fifth place. The North Eastern Railway resumes its old position at the head of the table, with the Great Central following hard after—there is only a point or so in the second place of decimals between them—and then comes the Great Western Railway with its much longer Paddington-Bath run, also above the "sixty" limit. The London and North Western journey is at a speed only the merest fraction under the mile-a-minute rate, and is well above the pre-war best, as is also the sterling South Eastern and Chatham "sprint" between Tonbridge and Ashford (often Stirling-hauled, by the way!), over a straight, but by no means absolutely level course. A minute off the Great Northern Grantham-Doncaster time brings that Company up one place, but still leaves it far below its traditional level in the matter of speed. Lower down in the table, I have based the North British position on what is really a conditional run, but which at the same time fairly represents the average running speed of a number of expresses over this level section, with the serious hindrance of Cowlairs bank cut out. The Glasgow and South Western Railway drops a place, as colliery subsidences between Cumnock and Mauchline have

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TABLE G.—SLEEPING CAR SERVICES, 1914, 1918 and 1922.

Total Nightly Sleeping Car Services.				Combined Restaurant and Sleeping Car Trains.		
Railways.	July, 1914.	Oct., 1918.	Aug., 1922.	Railway.	July, 1914.	Aug., 1922.
West Coast Joint	24	8	18	Caledonian	1	3
East Coast Joint	10	4	14	North British	1	3
London and North Western ¶ ..	8	8	8	Great Western	2	2
Great Western	8	—	8	Great Northern	—	2
M. and G. and S.W.	6	2	4	London and North Western	—	2
M. and N.B.	8	2	2	G. and S.W.	1	1
G.N. and N.E. †	2	2	2	Midland	2	—
Highland*	2	2	2			
Totals	68	28	58	Totals	7	13

¶ In addition to West Coast Services. † In addition to East Coast Services.

* In addition to East and West Coast through Inverness services.

compelled the easing out of all times between Kilmarnock and Dumfries by a couple of minutes, so that the Glasgow-Ayr 50-min. run must be reintroduced. Average of all the scheduled speeds of 1922 in this table exactly equals those of 1914 in the last column.

Restaurant and Pullman car services

TABLE H.—SLIP COACHES IN 1914, 1918 AND 1922.

Railway.	Where Detached (Number daily in brackets), 1922.	Total Number Detached.		
		1922.	1918.	1914.
G.W.	Reading (9), Westbury (3), Banbury (3), Bridgwater (3), Taplow (2), Twyford (2), Bath (2), Bicester (2), Leamington (2), Maidenhead (1), Didcot (1), Swindon (1), Chippenham (1), Newbury (1), Princes Risborough (1), Kingham (1), Moreton-in-Marsh (1)	36	—	70
L.B. and S.C.	Hayward's Heath (6), Preston Park (4), Polegate (4), Barnham Junction (2), Ashurst (2), East Croydon (1), Sutton (1), Horley (1), Three Bridges (1)	22	2	21
L. and N.W. ¶	Accrington (2), Rochdale (1) Midge Hall (1), Todmorden (1), Blackburn (1)	6	4	23
S.E. and C.	Faversham (2), Swanley (2), Herne Hill (1), Ashford (1)	6	—	8
G.N. (I)	Drogheda (2), Goraghwood (1), Lisburn (1) ..	4	—	—
G.E.	Waltham Cross (1), Broxbourne (1)	2	—	14
G.S. and W. (I)	Kildare (1)	1	1	6
G.C.	Woodford and Hinton (1)	1	—	4
M.G.W.R. (I)	Enfield (1)	1	2	1
Midland	.. ..	—	—	18
Caledonian	.. ..	—	—	10
G.N.	.. ..	—	—	1
Totals	.. ..	79	9	176

¶ L. and Y. section; 1914 total includes 16 L. and N.W. and 7 L. and Y. slip coaches.

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next claim attention, as set out in Table E. Here the figures of post-war improvement are really astonishing, and leave pre-war totals well behind. Last year the 1914 summer total of 475 restaurant and Pullman car trains had just been passed by 4; this year the aggregate expands to 558, or by no less than 16 per cent. at one bound. As compared with pre-war totals, the South Eastern and Chatham Railway has made the greatest advance—of exactly 100 per cent.—but from a small original total; on the other hand the Great Eastern Railway expansion of 83 per cent. in the number of trains on which restaurant facilities are offered, either in restaurant or Pullman cars, or both, brings that company into the third place in the table—a position of extraordinarily high merit in proportion to its route mileage and the general character of its traffic. The Caledonian increase of 77 per cent. is also highly creditable. On the actual basis of services proportioned to route miles, the London, Brighton and South Coast would take the lead, with one service per 8·3 miles, but these are, of course, very short journeys; then the Great Eastern Railway, one per 18·6 miles; the London and South Western Railway, another very enterprising line in the restaurant car direction, 19·6; Caledonian, 20·3; London and North Western Railway, 28·7; Great Western Railway, 31·3; Great Central Railway, 32·8, and so on. The fairest way in which to make this calculation would be to proportion the actual restaurant car miles run daily to the route mileage of the line concerned, but this is somewhat too exhausting an enquiry, even for me! One other item of increase worth noting is that of Pullman car trains, which have expanded in number from 131 in 1921 to 159 in 1922, or by 21 per cent. in a single year.

The Great Western Railway takes the top place, over the head of the London and North Western-Lancashire and Yorkshire amalgamation, with a total of all but a century—a wonderful daily record—and at the foot of the table a welcome is extended to the latest recruit, the Great North of Scotland Railway, with their new Aberdeen-Inverness service.

The method of calculating the number of restaurant and Pullman car services may here with advantage be recapitulated. Each separate train carrying in its formation a restaurant or a Pullman car, or more than one car, is counted as one, including (on the Great Eastern Railway) trains conveying both restaurant and Pullman cars. If any train is run over a portion of its journey with more than one car, and then divides into two portions, each carrying its own car, two restaurant car services are obviously counted instead of one; the 10 a.m. *ex*-Euston—dividing into two restaurant car trains from Crewe to Carlisle—is a case in point. But the 1.30 p.m. down "Scotsman," with two independent restaurant car trains in the same formation, is counted as one service only, over the London and North Western Railway, the train being undivided through to Carlisle. I mention these methods, as this table has been compiled with considerable care, and the compiler is in hopes that no subsequent communications will be received from lynx-eyed readers questioning its accuracy; the general principle is that, while each railway shall be credited in its individual total with all the independent services running over it, both self-worked and "foreign," there shall be no fictitious expansion of the grand totals by the same through trains being counted more than once on the lines of different companies.

"Foreign" restaurant car workings have this year become so exceedingly complicated, with all the new cross-country train services now in operation, that I have thought it better to tabulate them, as set out in Table F. The principle of calculation in this case is that the restaurant car shall make at least one or two stops on the "foreign" territory, so as to provide a "service"; otherwise it would be necessary to include innumerable unimportant examples such as the Great Northern Hull cars working over a short length of the Great Central Railway between Doncaster and Thorne Junction, or the same company's Harrogate cars working over the London and North Western Railway between Askern Junction and Knottingley, in neither case stopping anywhere on the foreign line. This table prompts some curious reflections as to the ubiquitous character of the rolling-stock of some railways. Great Western cars and their staffs may be found as far afield as Liverpool, Newcastle,

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Scarborough, Brighton and Dover; it seems as strange, also, to find a London and South Western car at Newcastle-on-Tyne as it does to find a North Eastern car at Westbury. Another oddity is that a railway company should provide a car and rolling-stock for runs of which a fraction only is performed over its own system; the North Eastern Railway York-Westbury car is a case in point, with only a little over one-seventh of the journey performed over North Eastern line or line in which the North Eastern Railway is jointly interested. The London and South Western car on the Bournemouth-Newcastle service, and the Great Western Railway car between Southampton and Scarborough are similar instances, the proportions of the parent systems being each about one-fifth. As usual, the North Eastern Railway welcomes the largest number of strangers, the cars of no less than six other companies being found at work within her hospitable borders. Two "foreign" companies also provide the first restaurant car workings over the Highland line.

As a complement to the restaurant car services, I have this year, for the first time, drawn up a table "G" of sleeping car services. In this case it is not practicable to refer to "sleeping car trains," as one train may be conveying cars for a number of different destinations, and I have therefore set out the total number of independent "services" to separate points offered by each railway, or group of railways. Many single services carry more than one car, and such a train as the 10.30 p.m. from Glasgow to Euston by the West Coast route never has less than four in its formation, and I have known as many as seven cars being worked up by this popular express, independent of the Edinburgh portion, which on such occasions, of course, has to be worked up separately. It will be seen that the totals still fall short of those of 1914, but this is principally due to the lapse of activity on the part of the Midland Railway and her partners, who have ceased to run their pre-war summer services from St. Pancras to Stranraer, Aberdeen, Fort William and Inverness—a total loss of eight services. On the right-hand side of the table will be found details of the trains on which, for parts of their journeys at least, both sleeping and restaurant car accommodation are provided; this happens, of course, on the longest journeys only, but is a direction in which considerable advances have been made during the last year or so.

Resumption of slip coach working is proceeding apace on certain railways, more particularly the Great Western and London, Brighton and South Coast, but we are still far behind pre-war standards in this respect, as Table H reveals. The 60 "slips" of last summer have now increased to 79, or by over 30 per cent., but the two railways just mentioned are alone more than responsible for the difference of 19. Reading, with its nine daily slips, takes the lead in numbers, followed by Hayward's Heath, with six daily. The Midland, Caledonian, and London and North Western (Division "A") Railways have none of them recommenced slipping operations, and those conducted on the Great Eastern Railway are but a shadow of the former total.

To sum up the summer services of 1922, one might say that in luxury of travel the standards of 1914 have been reached and left behind; in the matter of speed, whereas overall times, as detailed in Table A, still fall a little short of the old level, it is clear from Tables B, C and D that running speeds are, in general, fully restored, and that increases in end-to-end times are due mainly to the insertion of extra stops. Blemishes there certainly are on the summer time-tables—the bondage of "agreed" times over competitive routes is one—but on the whole there has this year again been distinct progress. Whether that progress will be maintained when grouping becomes effective is something which remains to be seen.

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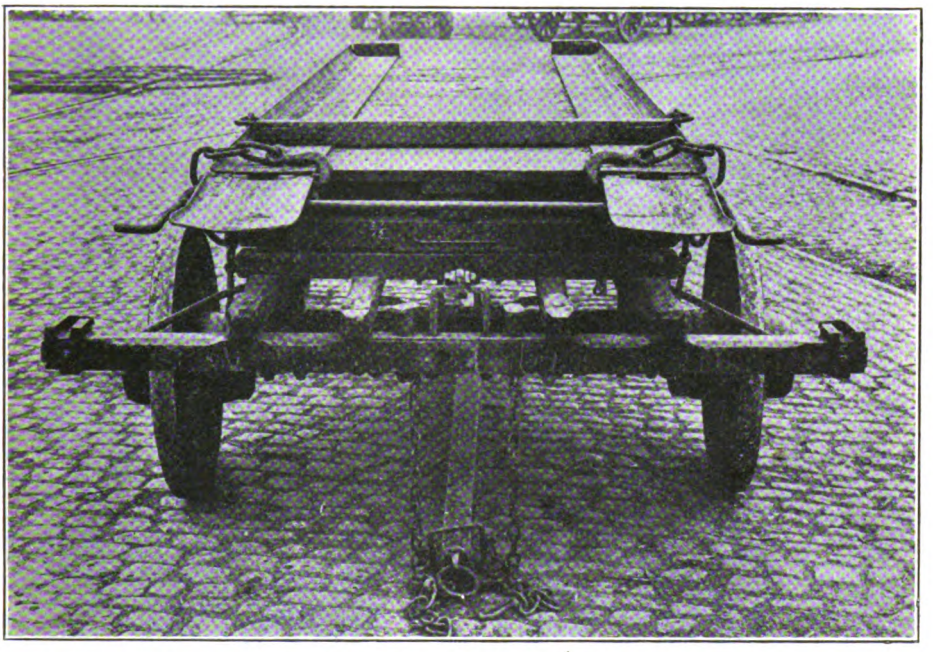
Improved Road Transport on the London & South Western Railway.

DURING recent years road transport has developed more rapidly than the facilities provided for it, even if allowance be made for the delaying and retrograde influences of the war period and the essential changes in conditions and requirements as compared with those of pre-war years, and at the present time, with so many restrictions limiting the output, it requires a scientific knowledge of control in order efficiently and economically to meet the requirements of traders.



"STAND TROLLEY," WITH "DEMOUNTABLE FLAT" REMOVED.

Road transport in London has to be operated under serious disadvantages, and although traffic is better controlled than in any other city, one has only to pass through the narrow thoroughfares encircling Covent Garden Market, Billingsgate, and in the vicinity of the majority of the wharves and docks along the riverside to realise the enormous wastage in transport strength. Motors and horses can be seen waiting on ranks for hours on end in order to reach premises for loading or unloading purposes. In pre-war days, when cartage could be operated over a period of 12 hours per day, and the cost of horse and motor upkeep was not what it is now, the question of detentions was not so vital, but with an eight hours' working day and the costs of working and of wages up by over 100 per cent., it is a different proposition. It is, therefore, obvious that unless something is done to avoid this wastage and to increase efficiency to a considerable degree, profitable operation is impossible of achievement.

In the attempt to solve this problem as it affected them, the London and South Western Railway very wisely directed their attention to the use of mechanically-propelled vehicles in replacement of the slower moving horses, with a view to making up time lost through detentions at firms' premises and in and about markets,

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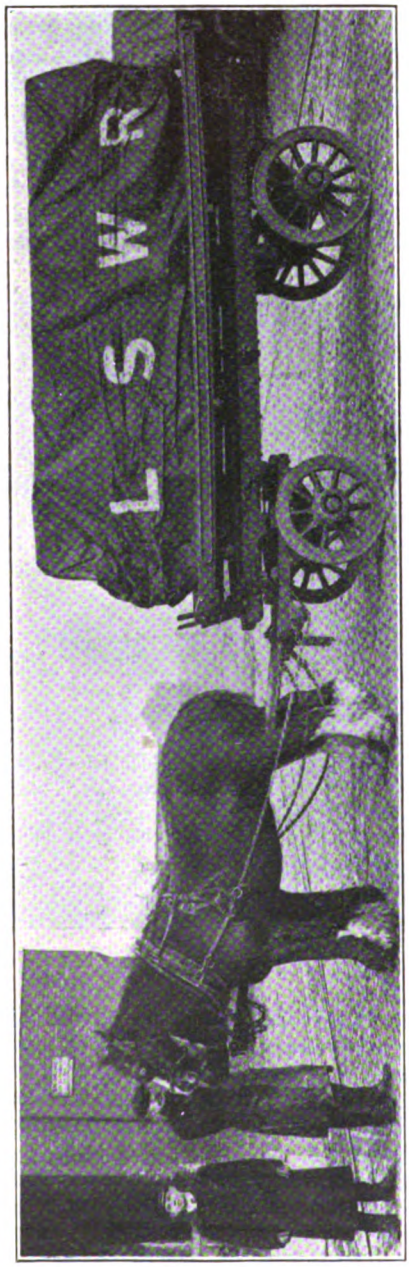
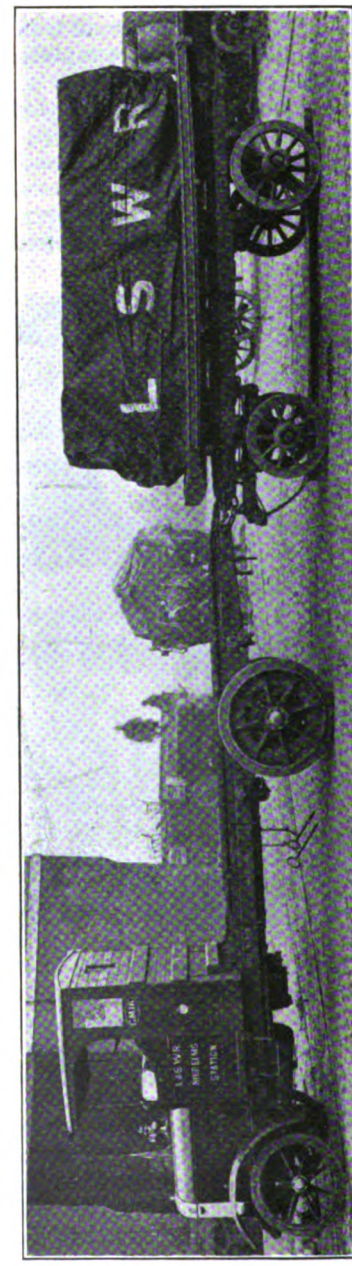


I. "DEMOUNTABLE FLAT" LOADED READY FOR TRANSFER TO MOTOR.



II. MOTOR IN POSITION FOR TRANSFERRING LOAD.

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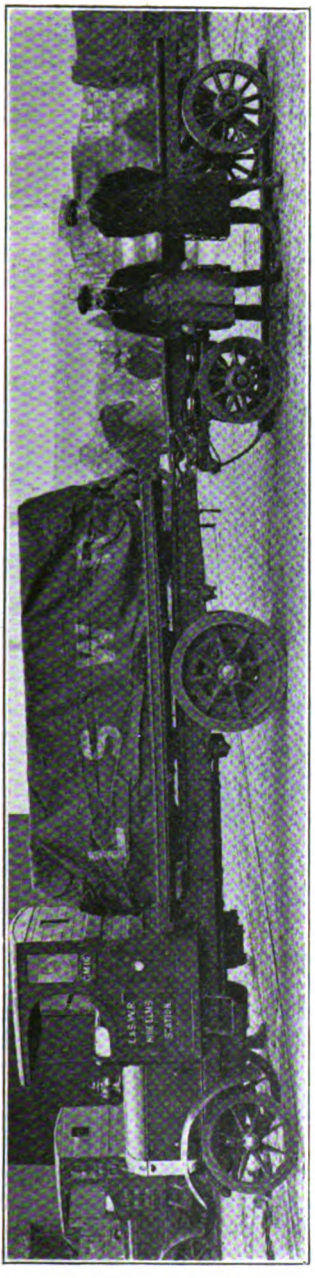
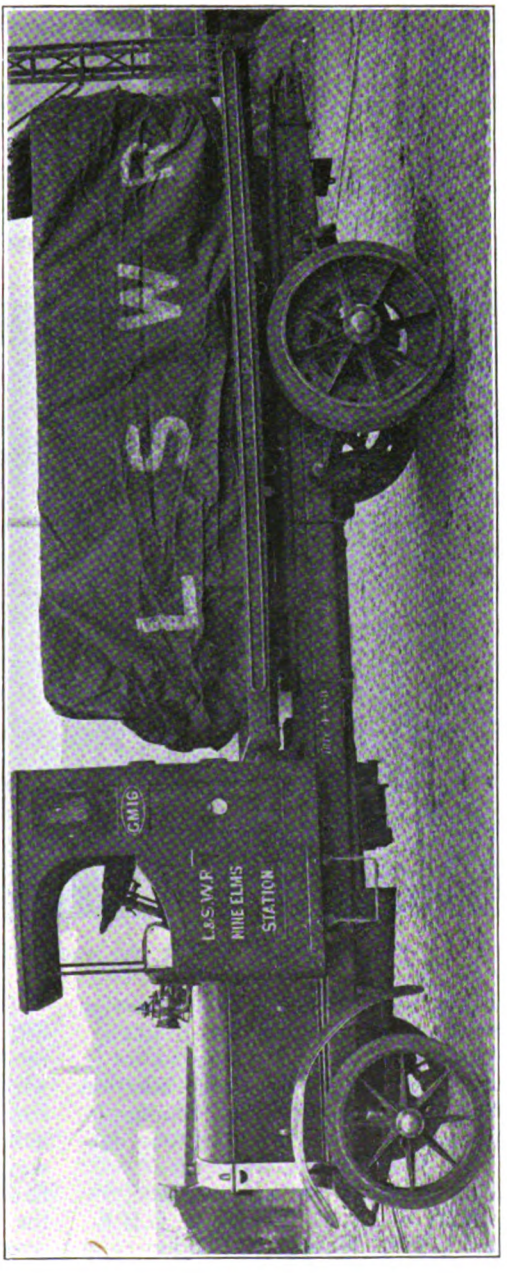


III. LOAD TRANSFERRED TO MOTOR.



IV. LOAD READY FOR DELIVERY.

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wharves, docks and riverside warehouses, also as a means of obtaining a better output per man, which obviously had been reduced with the shortening of working hours. It was found, however, by actual experience that to work motors successfully they must be kept on the move continuously. This could not be done with the ordinary standard lorry as it has, of necessity, to stand idle during the process of loading and unloading, at stations, as well as elsewhere, and the time thus occupied, in addition to the delays previously mentioned, represented approximately 50 per cent. of the men's rostered day.

MOTOR LORRY READY TO RECEIVE "DEMOUNTABLE FLAT."

It was necessary, therefore, to devise some means of overcoming this difficulty, and after very careful experiments a mechanical appliance has been adopted which has proved effective and economical. This method was briefly referred to in outline in the February, 1922, RAILWAY MAGAZINE; but we are now enabled, by the courtesy of Mr. G. T. Hedge, O.B.E., Outdoor Goods Manager, London and South Western Railway, to describe the system and equipment in detail and to reproduce a series of interesting photographs.

The system involves the use of what are known as "demountable flats," upon which the goods are actually placed, adapted to be exchanged between "stand trolleys" for loading or unloading and motor vehicles by which they are brought to the depôt with full loads or taken away for delivery. Each "demountable flat" is similar to an ordinary lorry top, but is fitted underneath with eight ball-bearing wheels. The flats are exchangeable between the "stand trolleys" and the motors, and are fitted with attachments for securing them in position on either vehicle. Length overall is 13 ft.; width, 6 ft. 7½ in.; carrying capacity, 4 tons; and tare, 10 cwt.

The "stand trolleys" are similar to ordinary horse trolleys, the tops being removed, but to obtain rigidity combined with cheapness, wood is used in place of steel springs. Two steel plates are fixed lengthwise, one on each side, to form runways for the wheels of the demountable flats, scotches and chains being provided for fixing the flats in position. Length overall is 12 ft. 1 in.; width, 3 ft. 11 in.; length of runway plates, 11 ft. 7½ in.; carrying capacity, 4½ tons; and tare, 18 cwt.

In the case of the motor lorries the usual type of body is omitted, and instead thereof

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two steel plates are laid from end to end of each chassis frame, similar in pattern to those fitted on the stand trolleys, and for the same purpose. A flat is secured to the chassis by means of special locking gear, front and back.

The stand trolleys, with empty flats resting in place, are berthed in the sheds overnight in readiness for loading on arrival of the inwards goods trains. As each flat is loaded it is hauled by horses to a parking ground, there to await the motors. Each motor driver is rostered on duty in accordance with the requirements of the traffic, and as his load is always ready for him, " idle time " and time wasted in loading or in placing a load in position are eliminated. As it becomes ready to take on a load a motor lorry is backed against a stand trolley and the loaded flat thereon transferred to the lorry by the motor driver and his attendant ; a simple operation quickly performed with little physical exertion.

The load is now ready for delivery, the operation of transfer and fixing in position having occupied only a few minutes. The delivery sheets are passed to the driver, with collection orders for a back load. On return to the station the collected load is immediately transferred to an empty stand trolley, and another loaded flat is taken, which process continues throughout the working day.

A large percentage of the standing idle time of both motors and men is thus eliminated altogether, with the result that the decreased output per man due to the shorter working day has been largely compensated for by the use of relatively simple mechanical appliances. The system described has now been sufficiently long in operation on the London and South Western Railway to show that the new conditions can be met by the introduction of modern ideas to meet modern requirements. There is no doubt as to the result ; it is not a mere paper economy, but very tangible operating gain.

It may be pointed out that as there are few manufacturing towns on the London and South Western Railway system, the traffic which has to be collected and delivered in London is of a very miscellaneous character, and includes a large quantity of returned empties, furniture, fruit, vegetables and foodstuffs generally, besides which the principal depôt at Nine Elms is unfortunately so positioned that long mileages are incurred in reaching the dense traffic areas.

The company's London goods cartage area covers approximately 120 square miles, and the average distance each ton has to be carted is nearly four miles. The fact that, in spite of these disadvantages, the average weight carted per motor per day increased from 8 tons 5 cwt. in October, when the flats were first introduced, to 10 tons 18 cwt. in April, is sufficient indication of the substantial value of the new system. A large number of motors with flats are doing as much as six loads per day each, and transport over 20 tons from point to point, and even this could be improved upon but for detentions incurred through circumstances which cannot be controlled by the company.

The whole of the company's motor drivers are ex-horse carters, and they are to be congratulated, not only for the courage shown in the conversion from driving horses to mechanically-propelled vehicles, especially in London, but for the manner in which they have put their backs into the work. It is only fair to say that the drivers are as eager as the management to see that this part of the company's business is a success.

A considerable number of vehicles adapted for use with " demountable flats " are now in use at London and South Western Railway depôts, not only in London but also at Southampton and Bournemouth. The motors are of 2 and 4-ton types, constructed for use with demountable flats by John I. Thornycroft & Co., Limited and by Karrier Motors, Limited.

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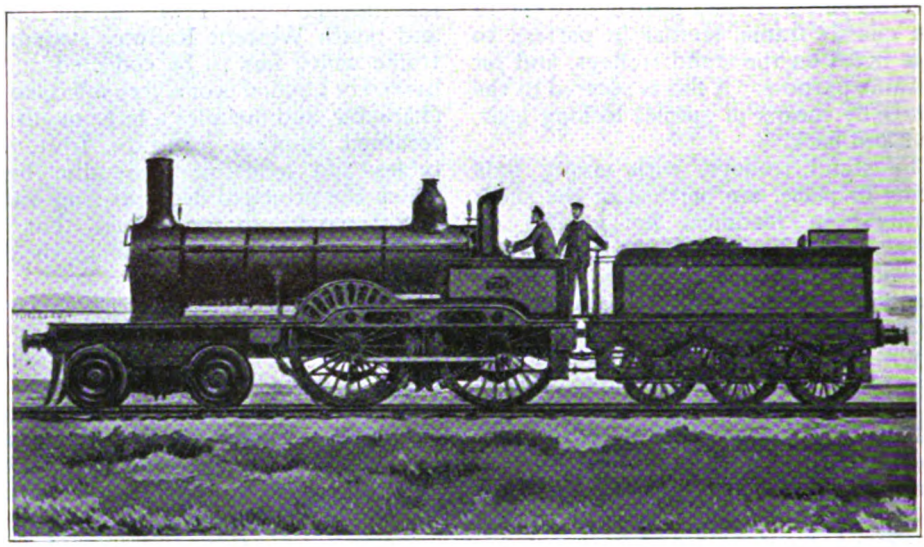

No. 224 AS ORIGINALLY BUILT.

4-4-0 Locomotive No. 224, North British Railway.

THIS engine is perhaps best known because of the great tragedy in which it was concerned, when, on the night of December 28, 1879, the first Tay Bridge was blown down and No. 224, with its train, submerged, causing the death of no fewer than 73 persons, including train staff and passengers. The story of the disaster has been many times told, and we may refer particularly to an article in the January, 1901, number of the RAILWAY MAGAZINE. On the evening of the fatal day a gale, unprecedented in its severity, swept over the town of Dundee, and a portion of the Tay Bridge, which had been opened for traffic only the previous year, gave way as the 4.15 p.m. mail train from Edinburgh to the North was crossing it. The engine was hauling five carriages and a van, the whole of the train falling into the river below. Scheduled to call at Tay Bridge station at 7.15 p.m., the train was signalled from the Fife side as having entered upon the bridge at 7.14 p.m. In the storm little could be seen at any distance, and the evidence of observers was that the lights of the train were seen as it proceeded along the bridge until "suddenly there was observed a flash of fire falling into the surging river; the train lights were seen no more, and in the fitful changes of the moonlight a large gap was discernible in the bridge." The story, as told in the article to which we refer, continues as follows:—

"Intimation of what had been observed was at once conveyed to the stationmaster (Mr. Smith), at the Tay Bridge station, and to the district locomotive superintendent of the North British Railway Company (Mr. Roberts) in Dundee, whereupon those gentlemen, in spite of the fierceness of the gale, of which the violence was such that no foot passenger could enter upon the bridge except at the risk of his life, proceeded along the bridge, and, after great exertion and laceration of the hands, caused by clinging to the rails, they were able to go far enough to see with certainty that a gap existed in the structure. The first evidences of the disaster, by which

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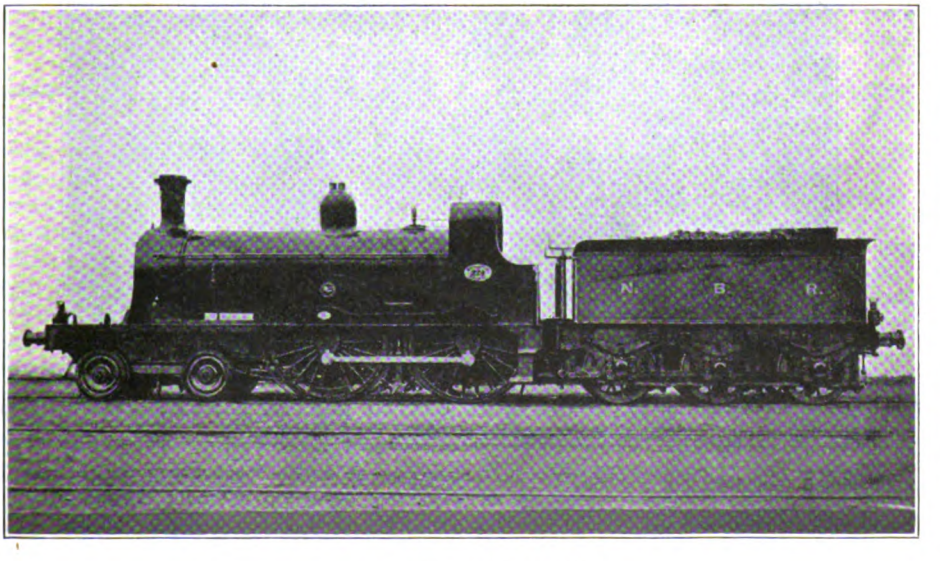
they were startled, were the clouds of spray from the overflow of the broken piping of the Newport water supply, which was laid alongside the rails on the bridge. Further, they could see that a number of the high girders had disappeared, but as the driving of the spray and the fitfulness of the moonlight prevented them from perceiving to what extent the structure had been destroyed, they returned to Dundee, and the worst fears of the crowds which had meantime gathered on the esplanade and at the Tay Bridge station were confirmed. There were still, however, those who believed that, although part of the bridge had fallen, the train with its living freight had either been saved from catastrophe, even within the high girders themselves, by the sudden application of the powerful brake, or that, fearful of the wind's violence, the officials at Wormit Junction had brought the train to a stand there. Many persons—in the absence of information to the contrary, through the breakage of the telegraph wires—clung to these slender hopes, but ere long news came from Broughty Ferry that two of the mail bags had been picked up on the beach there, and every doubt of the truth of the disaster, not to the bridge only but also to the train, was thereafter dispelled. The eyewitnesses, who, apparently, saw most, were the signalman (Barclay) in the cabin on the south side of the bridge, and a foreman surfaceman named Watt. The latter had just entered the cabin as the train came on from St. Fort, speed being reduced until Barclay handed the train staff to the driver. The speed at this time was about three miles an hour, but after receiving the staff, the driver put on steam, and the train proceeded steadily along the bridge."

No. 224 had been built in 1871 to the designs of Mr. Wheatley, and constructed at Cowlairs Works, so that at that time it would rank as one of the standard main line engines. By courtesy of Mr. W. Chalmers, Chief Mechanical Engineer, North British Railway, we are able to include a photograph of the engine in its original condition. The cylinders were 17 in. by 24 in.; the coupled wheels, 6 ft. 6 in. diam.; and the bogie wheels, 2 ft. 9 in. Weights in working order were: bogie, 12 tons 4 cwt.; driving wheels, 12 tons, 7 cwt.; and trailing wheels, 10 tons, 1 cwt. Total weight of the engine was, therefore, 34 tons, 12 cwt., and the tender, which had a water capacity of 1,652 gallons, 20 tons, 7 cwt.

After remaining submerged for some time, the engine was raised and found to be little the worse in regard to essential parts. It was therefore repaired and again placed in service. In 1886 it was



No. 224 AS LAST REBUILT.

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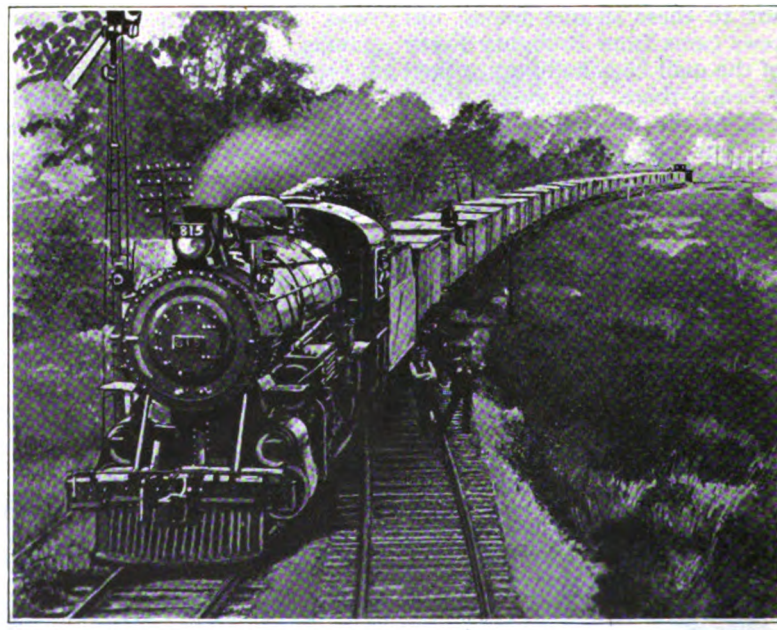
experimentally altered as a tandem compound locomotive and fitted with 'Joy" valve gear. In 1897 it was again rebuilt, and, by Mr. Chalmers's courtesy, we are able to illustrate it also in this form, in which guise it will, no doubt, have been familiar to many Scottish and not a few English readers. Cylinders and coupled wheel dimensions remained as originally, while heating surfaces were: fire-box, 90·55 sq. ft.; tubes, 949·4 sq. ft., total, 1,039·95 sq. ft.; grate area, 16·6 sq. ft.; boiler pressure, 140 lb. per sq. in.; weight in working order: bogie, 13 tons, 17 cwt., on driving wheels, 12 tons, 3 cwt.; on trailing wheels, 11 tons, 1 cwt.; total, 37 tons, 1 cwt.; engine and tender, 57 tons, 8 cwt. The original dimensions of the tender, though rebuilt to some extent, remained substantially unaltered. No. 224 was re-numbered 1192 in May, 1913, and disposed of as scrap in 1919. At one time this engine worked between Edinburgh and Perth, and in 1900 the present writer remembers seeing it appear in Newcastle (Central) station, North Eastern Railway, on a train from Hawick or Riccarton.

AUTOMOBILE TRAFFIC ON THE CANADIAN PACIFIC RAILWAY.



LOAD OF "STUDEBAKER" AUTOMOBILES CRATED FOR TRANSIT BY RAIL AND SEA FROM WALKERVILLE, ONT. TO ENGLAND.

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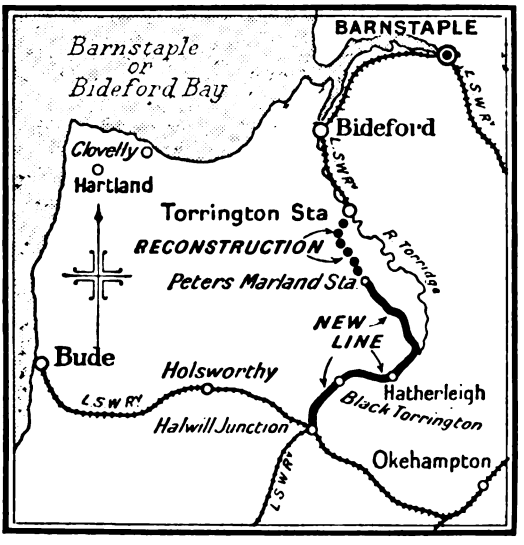
North Devon and Cornwall Junction Light Railway.

IN the August RAILWAY MAGAZINE there appeared on page 162 an illustration showing Mr. Arthur Neal, M.P., Parliamentary Secretary to the Ministry of Transport, inaugurating engineering works on the new line which is to connect Halwill Junction with Torrington, by cutting the first sod at Hatherleigh. To Lieut.-Colonel H. F. Stephens, M.I.C.E., the engineer to the company, we are indebted for further facts and data concerning engineering features of the venture. A sketch map of the new railway is given herewith.



The line, which will be between 20 and 21 miles in length, will pass through an agricultural country of undulating and moderately hilly character. Of the total length about 5¾ miles consists of a reconstruction of the existing 3 ft. gauge mineral line connecting the North Devon Clay Company's works at Marland with the London and South Western Railway at Torrington station. This existing line has somewhat sharp curves and heavy gradients, but these will be modified, at small expense, to a minimum grade of 1 in 42, and a minimum radius of curvature of 9 chains. On the new portion of the line the ruling gradients will be 1 in 50 and the sharpest curve 9 chains radius. The line will be single track throughout, the gauge 4 ft. 8½ in., and rails of the London and South Western type will be used. The sleepers will be of oak, cut and worked in the district.

Stations of a simple nature will, according to present arrangements, be built at the following places, in addition to the accommodation at the terminals, viz.: Peters Marland, Hatherleigh and Black Torrington. At Huish and at Meeth halts will be provided. There may also be "conditional" stops at suitable points for passenger traffic and small siding accommodation for goods traffic, at certain road crossings, should the working company hereafter so decide.

For the most part the cuttings and the embankments are shallow and moderate in extent. The most costly single item of constructional work is the building of a viaduct to carry the railway over the River Torridge near Torrington station. This viaduct is estimated to cost about £13,000 at present-day prices, and is designed with nine spans of 60 ft. each.

It is proposed to construct the line, in the first instance, as a pioneer line. The station buildings and other works will be of the most simple character, but so arranged as to be capable of later developments, when the traffic conditions make such steps desirable. Under a working agreement, the line will be conducted and maintained in perpetuity by the London and South Western Railway Company.

The narrow gauge line of the Marland Clay Company, before referred to, at present carries over 42,000 tons of ball clay, bricks and agricultural traffic per annum, and it is estimated that a further 145,000 tons of similar traffic per annum will be available immediately after the completion of the line. A considerable traffic in cattle is anticipated, and the district, already popular with tourists, will ensure a good holiday passenger traffic.

It is proposed to develop clay higher up the valley by means of a new clay corporation called the Meeth Clay Company. The new line has been strongly advocated for a long period of years, and, when opened, will beyond question be a great boon to the districts served.

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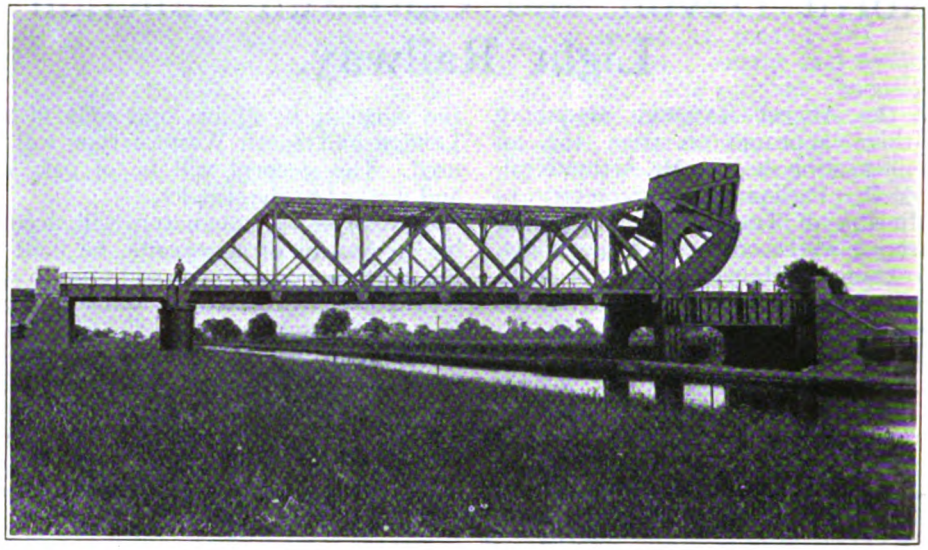

SCHERZER LIFT BRIDGE OVER THE AIRE AND CALDER CANAL AT POLLINGTON.
Constructed by Messrs. John Butler & Co., Ltd., Stanningley Iron Works, Leeds.

The Gowdall and Braithwell Joint Railway.

THIS line was promoted by the Hull and Barnsley Railway Company in 1909, for the purpose of obtaining direct access to the Bullcroft, Bentley and Yorkshire Main Collieries, at which sinking operations were then proceeding; also to the Thurcroft Colliery on the Great Central, Hull and Barnsley and Midland Joint Line, and the Dinnington Colliery on the South Yorkshire Joint Railway, to which the Hull and Barnsley Company had running powers from Laughton Junction (West) on the Great Central, Hull and Barnsley and Midland Joint Line. The new line also gave a shorter route to the Hull and Barnsley Company's Alexandra Dock, Hull, from the Nottinghamshire and Derbyshire coalfields. The contract for the construction was let to Logan and Hemingway, contractors, Doncaster, early in 1911.

The connection with the Hull and Barnsley main line is at Aire Junction, and between that point and Braithwell Junction branches to the Bullcroft, Bentley and Yorkshire Main Collieries have been constructed, and stations for dealing with passenger and merchandise traffic provided at Snaith and Pollington, Sykehouse, Thorpe-in-Balne, Doncaster and Warmsworth. Doncaster station is a terminus, about half-a-mile from the market place, and is reached by means of a short branch line having two connections with the main line, one from the north and the other from the South.

The Great Central Company were granted by Parliament one-third share in the ownership of the line, but by agreement with the Hull and Barnsley Company, and with the authority of Parliament, this was subsequently altered to a half partnership. The management of the undertaking is vested in a Joint Committee consisting of three directors of each of the two companies.

Connections with the Great Central Company's Doncaster "avoiding" line have been laid in at Sprotborough Junction. Statutory running powers were granted to the North Eastern, Midland, Lancashire and Yorkshire and Great Northern Companies, but so far these have not been exercised.

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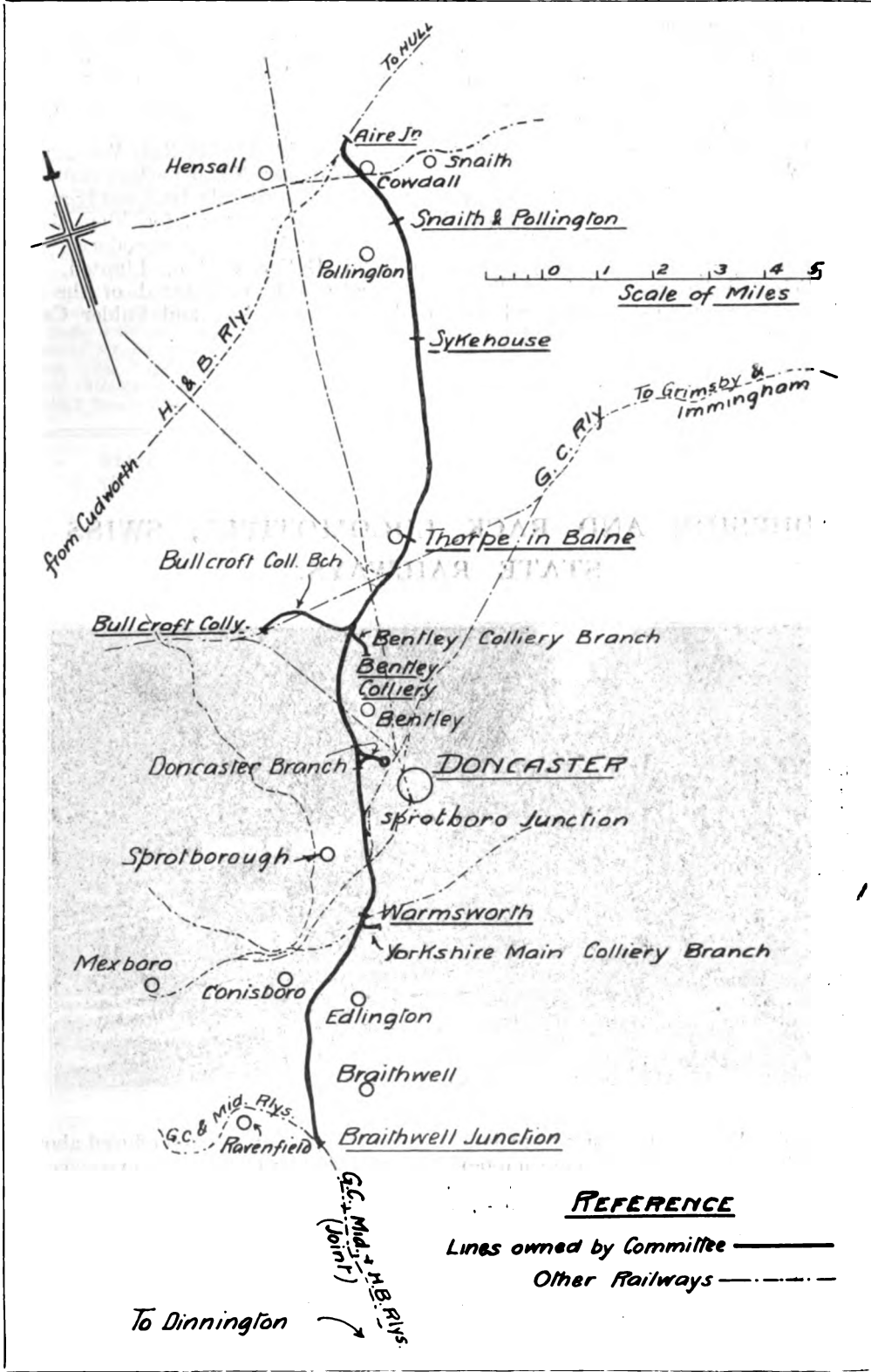

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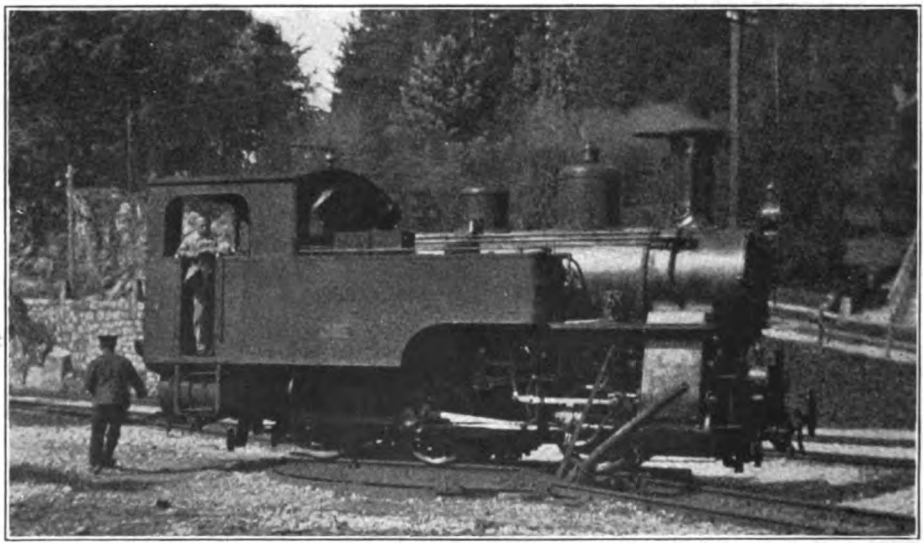
The length of the main line is 21 miles 9 chains, and is double throughout. There is no gradient between Aire Junction and the first 14 miles steeper than 1 in 150, but from that point to Braithwell Junction there is a gradual ascent, the heaviest gradient being 1 in 94 for about two miles beyond Warmsworth Station.

The line passes through some pretty country which is mainly agricultural, and though the population of the adjoining villages is somewhat sparse at present, it is anticipated that when further colliery developments accrue, there will be a large influx of residents in the neighbourhood.

The railway was opened for goods, coal and other mineral traffic on May 1, 1916. It was originally intended to inaugurate a passenger train service, but there is not sufficient traffic at present to justify this.

We are indebted to Mr. R. L. Wedgwood, General Manager, North Eastern Railway, with which company the Hull and Barnsley is now amalgamated, for the above particulars and the map reproduced, and to John Butler & Co., Limited, for the photograph reproduced of the lift bridge over the Aire and Calder Canal at Pollington.

ADHESION AND RACK LOCOMOTIVES, SWISS STATE RAILWAYS.



TO Mr. A. McE. Gibson we are indebted for the photograph reproduced above, illustrating one of seventeen 0-6-0 rack and adhesion locomotives in service on the Brünig–Meiringen section of the Swiss State Railways. These locomotives are designed to haul trains of 50 (metric) tons up the maximum grades of the rack section, and they are adapted for speeds of 13 and 40 km. per hour, respectively, on the rack and adhesion sections. They have four cylinders, two for the adhesion wheels and two for operating the rack pinions. Cylinders are 15¼ in. diameter and 18 in. stroke. Coupled wheels have a diameter of 36½ in., and the weight of each locomotive in working order is about 32 tons.

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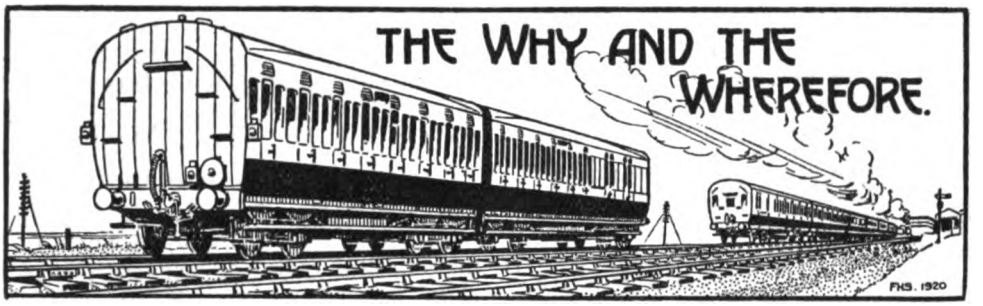

RAILWAY MAGAZINE readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions and weights of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. No reader should send more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, the pages of the "Railway Year Book," should be consulted. The twenty-fifth Annual Edition of this standard railway reference work is on sale at 5s. net, or by post from the RAILWAY MAGAZINE Offices, 33, Tothill Street, Westminster, London S.W.1, to any part of the world, 5s. 9d.

Ridge Bridge Station.

Mr. J. W. Armstrong points out that there is a halt, built apparently to serve the workers at the Ridge Bridge Collieries, on the North Eastern Railway, between Garforth and Micklefield stations. Certain workmen's trains only call there. Mr. G. W. G. Cass, of Scarborough, in giving the same information, mentions that the station is located at the point where the Roman road between Castleford and Wetherby crosses the line. Mr. G. A. Bamlet mentions that this station was opened either in 1912 or 1913, and was closed to ordinary passenger traffic on March 31, 1914, quoting "Bradshaw" as his authority. The station remained open, and is apparently still used, for workmen's traffic. Mr. J. M. Adams states that the road which here crosses the line is marked on some maps as "Roman Ridge." The halt was included in "Bradshaw" only during 1913 and part of 1914. Mr. C. H. Hinchcliffe, of Leeds, a North Eastern Railway engine driver, mentions that on Sunday nights a train from Leeds calls at every station to Ridge Bridge, then continues fast to York, apparently to pick up colliery workers requiring to detrain at Ridge Bridge.

[Further reply to H. S. GREATOREX.]

Movable Diamond Crossings.

Movable crossings, such as the one seen in the photograph of Wilmslow station, London and North Western Railway, page 136 of the August issue, have the valuable advantage of offering a continuous rail to the wheels at the point of crossing, without the customary flange-way gaps. In this way it is possible to lay down diamonds to a considerably more acute angle than the 1 in 8 minimum previously enforced, without the slightest danger of a wheel taking the wrong side of the point, as there would be with a crossing of the ordinary pattern. Crossings of this type are more prevalent in America than over here, but a number are in use in Great Britain, especially on the London and South Western and Great Western Railways. The fine lay-out at Reading West Junction is a notable example on the last-mentioned railway.

[Reply to C. B. SMITH and M. A. OLDHAM.]

Sunday Trains.

We are not aware that Sunday trains have any special reputation for late running, except that they are liable to delays owing to engineering works, temporary single line working, &c., and special work which can only be done on Sunday (such delays are usually allowed for, hence the somewhat slow timings of many Sunday trains), and they may have to make more connections than on a weekday, and may, therefore, have to wait at certain junctions. In the case you mention, there are probably a number of important connections to be made, so that the train concerned, or one of those with which it connects, is liable to be late. Habitual unpunctuality is not, however, favoured by any railway company, and

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all such cases are investigated by train running officials with a view to remedy.

[Reply to F. MARSHALL.]

London and North Western Railway Manchester Expresses.

The 10.30 a.m. down is due to arrive Wilmslow 1.58 p.m. depart for Halifax 2.5, and Manchester (London Road) 2.7 p.m., reaching the latter 2.30 p.m. The 6.30 p.m. runs non-stop to Wilmslow, due 9.46 p.m., departs for Halifax and Manchester (Victoria) at 9.49 p.m., and for London Road 10 p.m., due 10.30 p.m. As the distance between Wilmslow and London Road *via* Styal, is only 11½ miles, it is clear that the two trains could arrive at Manchester with ease in 3 hours 50 and 35 min. from Euston, were it not for the agreement with the Midland Company as to not cutting the times below 4 hours.

[Reply to A. P. le M. SINKINSON.]

Compartment Stock on Metropolitan Railway Electric Trains.

For some time past some of the trains working on the Uxbridge and other electric services of the extension line have been made up of ordinary open motor cars at each end, with a number of compartment carriages between. They are thus practically equivalent to the compartment-stock trains in which the end vehicles have been converted to motor cars, otherwise retaining their compartment character, but without the expense of such adaptation. Electrical connections are, of course, provided through the intervening compartment vehicles to provide for the control of both motor cars from either end.

[Reply to G. MOODY.]

Charing Cross as a Continental Traffic Terminus.

Seeing that Charing Cross has ceased to be used at all as a station for South Eastern and Chatham Continental boat trains, your suggestion that it should be made a centre for all the Southern Continental services appears to be somewhat out of place. It is true that both London & South Western and London, Brighton and South Coast Continental trains could be routed to run to or from Charing Cross, and it is impossible to prophesy as to what may occur when all three systems come into the Southern group. At the same time the tendency is rather towards centralising such traffic upon Victoria.

[Reply to C. THOMPSON.]

Strathaven and Darvel Line.

Mr. R. Killin, Superintendent of the Line, Caledonian Railway, explains that this line was closed during the war, part of the track being subsequently lifted to meet Government requirements. It has been recently relaid, but only the part between Strathaven and Ryeland has yet been reopened for traffic. First-class traffic has always been almost negligible, and it is found quite sufficient to provide third-class accommodation only. Mr. Killin points out that the line from the county boundary to Darvel is the property of the Glasgow and South Western Company.

[Reply to HAROLD BARGER.]

West of England Trains.

As the service is provided entirely by the Great Western Railway, it is only to be expected that the rolling-stock of the Birmingham-Penzance through trains would be made up exclusively of that company's stock. The running of a six-wheeled Lancashire and Yorkshire Railway saloon carriage, as noted by you, was no doubt due to the provision of a through carriage for a party travelling from a station on the Lancashire and Yorkshire section of the London and North Western Railway to a destination in Cornwall, the service being given by attaching it to the Great Western train.

[Reply to "MOGUL."]

London, Brighton and South Coast Railway Corridor Coaches.

We note your remark that the corridor vehicles are not always coupled up so as to permit of trains being vestibuled throughout, even in the case of certain special business expresses to and from London Bridge and Victoria. Unless it is required to examine tickets while travelling, or to give access to Pullman cars for the supply of refreshments, &c., there is relatively little need for vestibuling trains throughout on this line, but, in any case, the provision of side corridors gives all compartments in a coach access to lavatory accommodation.

[Reply to F. L. H. F.]

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The Southern Group.

There is no particular reason, as far as we are aware, for the "Southern" being Group I, except that a start had to be made with one or another of the four groups. You suggest that the Western group should have come first, but again there is no reason for this. If size is to be the governing factor the North Western, Midland and West Scottish group should be given pride of place, though it is nearly approached by the North Eastern, Eastern and East Scottish group. Principal statistics of mileage, &c., have already been given in these pages.

[Reply to "SOUTHERNER."]

Pullman Cars.

The tendency to-day is towards multiplication of these vehicles rather than to their discontinuance. At the same time it is a matter for individual railway companies to decide as to whether they will place them on long journey services and on routes where they are not at present employed. We may mention that Pullman cars at one time ran on the London and South Western Railway to Bournemouth, but have long since been discontinued in favour of restaurant car and "light refreshment" trains on the Bournemouth route and restaurant cars on the Plymouth and West of England services.

[Reply to C. THOMPSON.]

Railways in the Swansea District.

Although all the standard gauge Welsh railway companies are being absorbed by the Great Western Railway Company, that will not affect the fact that both the London and North Western and the Midland Companies have lines in this district. In the case of the latter access has to be obtained by using the Cambrian, Brecon and Merthyr and Neath and Brecon lines, and the running powers and arrangements whereby this is done will apply notwithstanding that the companies hitherto owning this section are now amalgamated into the Great Western.

[Reply to R. D. J.]

Branch Lines.

Please consult *Bradshaw* or the railway companies' time-tables to ascertain whether passenger trains are now worked over the sections you name. Several have been closed, however, such as the Basingstoke and Alton Light; and Bideford, Westward Ho! and Appledore. In other cases we cannot say, without local enquiry, as to whether goods traffic is worked over sections where passenger trains do not run. In regard to the two lines mentioned above, the permanent way was taken up during the war and has not yet been restored.

[Reply to A. P. MIALL.]

Lynton and Barnstaple Railway.

This line was fully described in early numbers of the RAILWAY MAGAZINE, and more recently in the issue for May, 1917. As the gauge is 1 ft. 11½ in., obviously no class of main line locomotive belonging to the London and South Western Railway could possibly work upon it, and certainly not express engines of the 745 class, as suggested by you. The gradients are very severe, being as steep as 1 in 30 in places, and at times it is necessary to double-head the trains, which, during the season and on Barnstaple market days, frequently load up very heavily.

[Reply to KEITH COOPER.]

Speed Indicator or Mechanical Lubricator.

Mr. S. Richards suggests that the arrangement noted was possibly a connection operating a mechanical lubricator fitted in the cab and worked from the rear coupling pin, and not a speed indicator as suggested. He noticed this arrangement as fitted to a "George the Fifth" class locomotive at Chester. We are open to correction, in view of the very brief particulars submitted to us; possibly a reader who has seen No. 238, *F. W. Webb*, lately, can supply more exact information.

[Further reply to E. J. GITMAN.]

Westinghouse Engines, South Eastern and Chatham Railway.

The standard brake on the London, Chatham and Dover section before the constitution of the Managing Committee was the Westinghouse, and although the Vacuum is now the standard for the combined system, most of the engines intended for working on the Chatham section require to have Westinghouse equipment, as at times they may have to work stock which is not fitted with the Vacuum brake.

[Reply to F. L. H. F.]

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Piloting West of Newton Abbot, Great Western Railway.

You need hardly be surprised at the necessity for piloting any load at all over the normal on this section, in view of the extraordinary character of the gradients—as steep in parts as 1 in 42 for two miles continuously, and near Dainton Summit even 1 in 37 for a short length. Such inclinations are altogether outside ordinary working conditions. If an extra stop is thus made at Newton to attach a pilot to Plymouth a late arrival of the down "Riviera" at North Road is almost inevitable.

[Reply to D. T. C.]

Colours of Great Western Railway Rolling-Stock.

In further reference to the reply given in the September RAILWAY MAGAZINE, Mr. G. Moody mentions that, according to the *Locomotive Magazine* for January, 1908 (pages 18-19), "until the middle 'fifties the Great Western Railway painted their coaches the following colours: first class, yellow; second class, brown; third class, green." The article adds that at that time there were no composites.

[Further reply to A. J. MAXWELL.]

Somerset and Dorset Joint Railway Locomotives.

The 0-4-4 tank engine you noted at Radstock station was, we believe, a Midland engine lent or transferred to the Somerset and Dorset Joint Railway, and apparently still retaining its Midland red livery, though in other respects adapted to Somerset and Dorset Joint Railway standards. The letters on the cab sides indicate the loading classification respectively for passenger and goods working.

[Reply to "SOMERSET."]

Great Eastern Railway Locomotives.

The standard blue livery was abandoned during the war, and, so far, the Great Eastern Railway has not reverted either to its pre-war practice in this respect or to a new colour scheme for its locomotives. The engines are, therefore, painted only in a grey lead colour. The large numerals now placed on tenders or on the tanks of tank locomotives apply in connection with train control, which has recently been adopted by this railway.

[Reply to P. R. WALLIS.]

Locomotive Chimneys.

At one time there were, on many railways, engines having chimneys of a more or less ornamental character and having brass or copper rims. On the North Eastern Railway brass-rimmed chimneys were very generally used, and no doubt some of these are still running thus ornamented, though the tendency nowadays is to use plain chimneys and to paint over the brass and copper where originally fitted.

[Reply to G. W. S.]

Welsh Highland Railways.

This is a scheme for amalgamating several narrow-gauge railways in Wales with a view to completing extensions already authorised and consolidating as a single system and undertaking further extensions. The lines concerned are the North Wales Narrow Gauge; Portmadoc, Beddgelert and South Snowdon; Portmadoc, Beddgelert and Carnavon Light; and Festiniog Railways.

[Reply to W. H. ROBINS.]

Rebuilt South Eastern and Chatham Railway 4-4-0 Engines.

Both Wainwright classes "D" and "E," non-Belpaire, as well as Belpaire 4-4-0 engines, are included in the rebuilding programme now being carried out by Mr. Maunsell. We believe that the rebuilding of the "440" and "240" Stirling classes is also still proceeding, but does not include the provision of superheating apparatus.

[Reply to "HASTINGER."]

Glasgow-Ayr-Stranraer, Glasgow and South Western Railway.

We know of no faster schedule than 50 min. having been in force at any time between Glasgow and Ayr. Before the war a special express train ran regularly from Stranraer to Glasgow in connection with the Belfast steamer, but passengers in the opposite direction had to leave Glasgow by ordinary train for Stranraer overnight.

[Reply to ALEX. W. ANDERSON.]

Great Northern Railway Locomotive No. 1470.

This engine, also the similar engine No. 1471, which is now in service, has been working more or less regularly between

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Doncaster, Peterborough and London, principally, we believe, on heavy Leeds expresses. The photograph used at the head of Mr. Allen's article this month shows it on a train passing Sandy.

[Reply to P. RANSOME WALLIS.]

London and South Western Railway Locomotives.

Apparently you refer to Mr. R. W. Urie's latest class of main line locomotives, No. 736–745. These now work the heaviest and fastest trains, particularly on the West of England expresses. Your second query is answered by the frontispiece to this number of the RAILWAY MAGAZINE. Your further suggestion will be considered in due course.

[Reply to J. E. S.]

Vacuum Pump *v.* Ejector.

Use of a pump instead of an ejector has the advantage of avoiding a certain constant drain on the steam supply, but there are also objections to its use. A number of London and North Western engines were at one time so fitted. We do not know who originated the vacuum pump system as used on the Great Western Railway.

[Reply to J. C. L. PARSONS.]

Scottish Locomotives.

Strictly your query is not in accordance with the rules, as you ask for particulars of individual locomotives. We believe, however, that several of Mr. Connor's 4-4-0 engines with 7-ft. 2-in. coupled wheels, Caledonian Railway, are still in service, as also many, if not all, of the Highland Railway 4-4-0's, Nos. 72 to 84 and 89 to 100.

[Reply to T. MORRIS.]

4-4-2 Tank Engines, London and South Western Railway.

Many of these engines have now been transferred to the duplicate list, the number being underlined, in accordance with the practice of this railway, to indicate that the same number has been allotted to a new engine, the old one using the underlined number as long as it remains in service.

[Reply to "EAGER."]

The Great Western Railway and Constituent Company's Locomotives.

We are advised that locomotives belonging to companies which are being amalgamated with the Great Western Railway are being renumbered according to their types, and not in groups for each company. Numbers do not, moreover, necessarily run consecutively, as gaps which occur here and there are being filled up.

[Reply to H. F. B.]

Electric Locomotives, North Eastern Railway.

These are numbered in a separate series, which will be obvious from the fact that the freight engines bear numbers 1–12, while the new 4-6-4 express passenger engine is numbered 13. Your remarks concerning old North Eastern Railway locomotives recently noted by you are of interest but hardly call for mention here.

[Reply to J. W. ARMSTRONG.]

Birmingham-Bristol Route, Great Western Railway.

Half of the Cheltenham-Gloucester section is owned by the Great Western and half by the Midland Company, though for traffic purposes it is operated jointly. From Stonehouse via Berkeley Road and Yate to Coalpit Heath the Midland route is used by Great Western expresses by virtue of running powers.

[Reply to T. A. LITTLE.]

Four-Cylinder Engines.

We are unable to agree that the disposition of the cranks of a four-cylinder engine at 45 deg. relative to each other would give a more even torque than the existing three-crank types at 120 deg., or four cranks set at 90 deg. It would require an eight-cylinder engine to give the torque that you have in mind.

[Reply to T. B. D.]

Electric Rolling-Stock, Great Western Railway.

The 20 motor coaches and 40 trailers mentioned in the "Railway Year Book" represent the Great Western share in the Metropolitan and Great Western joint stock used for working Hammersmith and City railway traffic and generally running between Aldgate or New Cross and Hammersmith.

[Reply to V. ROBINSON.]

Welwyn Viaduct.

To our knowledge, there is no restriction upon the passage of the new 4-6-2 engines on the Great Northern Railway over this viaduct. They must traverse it

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when working trains to or from London, and we do not understand whence you can have obtained the impression that it was in any degree insecure.

[Reply to E. J. E.]

New Rolling-Stock, London and South Western Railway.

Mr. T. H. Donohue points out that a set of vestibuled green-painted coaches with facilities for the service of light refreshments, as used on the Bournemouth route, is now running on the 7.2 a.m. train from Portsmouth Harbour, returning on the 3.50 p.m. down express from Waterloo.

[Further reply to W. THOMPSON CLARKE.]

Margate West Station.

The bridges you mention, also the terminal lines on the up side of the station, are part of a scheme for connecting up with the lines into Margate Sands station, and were built at the time the West station was rebuilt in preparation for the remainder of the scheme when it is taken in hand.

[Reply to H. A. POPER.]

Safety Limits.

There is no specified limit as to the speed at which trains are allowed to run, but, obviously, exceptionally high speed is not favoured, and at many places and on particular sections of line, trains must not exceed speeds regarded as safe according to individual conditions.

[Reply to F. H. V. P.]

"Eastleigh" Works.

The locomotive works were described in the RAILWAY MAGAZINE, January, 1911, the carriage works in an earlier issue. Your further suggestion is noted. Also your remark that 4-4-0 engine No. 313, illustrated on page 115 of the August number is now rebuilt and superheated.

[Reply to H. SMITH.]

Midland Railway Tunnels.

Your request is rather too comprehensive for attention here. See *Railway Year Book* for lengths of tunnels exceeding one mile, and articles in the RAILWAY MAGAZINE describing sections of the Midland system, or consult Williams' or Stretton's histories of the Midland Railway.

[Reply to "CHALONER-WHIN."]

Assorted Engines and Tenders.

We have previously commented on the fact that repairs to a tender, when the engine itself is in perfect order, not infrequently necessitates an odd engine and tender being "paired" for the time being. You doubtless saw such a temporary union.

[Reply to T. A. H.]

Great Eastern and Great Northern Railways at Wood Green.

Many prospective connections between grouped lines have been mooted and discussed, of which the above is a case in point, but the majority of them have no official character, and there is no definite prospect of their being carried out.

[Reply to T. A. H.]

The Great Northern Railway and Halifax.

There is no advertised return working of the through Halifax coach now run on the 5.45 p.m. ex King's Cross, and worked forward specially from Doncaster via Wakefield (Kirkgate) and the London and North Western (Lancashire and Yorkshire) line.

[Reply to M. A. OLDHAM.]

London, Brighton and South Coast Locomotive Exhaust.

Modified sound of exhaust in the case of certain of the large Billinton 4-4-0 engines, which you have noted, is probably due to the fact that the engines referred to are among those which Mr. L. B. Billinton has recently rebuilt with superheaters.

[Reply to "STEAM."]

London, Brighton and South Coast Railway Electric Stock.

Use of certain of these vehicles on ordinary main line passenger traffic is doubtless due to the fact that there is at present a surplus for existing electric requirements, and the stock cannot be allowed to remain idle.

[Reply to "STEAM.]

Ledbury Tunnel, Great Western Railway.

A gradient profile of the section which includes this tunnel was published in the RAILWAY MAGAZINE for May, 1908 (now out of print). The gradient through the tunnel is 1 in 80, the approach being slightly more severe.

[Reply to G. B. DREW.]

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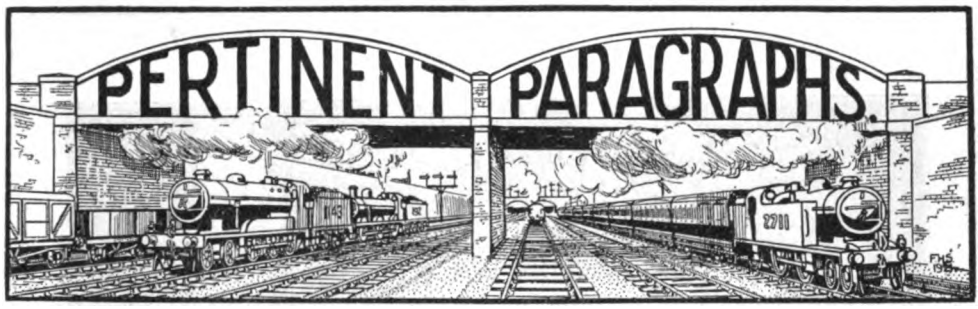

Scottish Railway Rates.

WHEN the English and Welsh railway companies made special concessions to the iron and steel trades by experimental reductions in selected raw materials as from November 1, 1921, the Scottish railways were unable in view of their special circumstances, to make any reductions. They were also unable at the time to make the reductions granted by the English and Welsh companies as from January 1, 1922, in the rates for the carriage of coal, limestone for chemical works, lime in Class B for iron and steel-making purposes and iron and steel in Class B. In May of the present year, however, when further concessions to the iron and steel trades were made by the English and Welsh companies, and the additional charge for collection or delivery of merchandise was reduced from 1s. 6d. per ton to 9d. per ton, the Scottish railways reduced the rates for shipment coal and lowered certain flat rate additions, besides reducing the collection and delivery charges. The Scottish companies have now agreed that the through conveyance rates for all classes of merchandise are to receive, as from August 1, exactly the same reduction as the rates in England and Wales; the small parcels scale is to be reduced from 150 per cent. to 100 per cent. above the rates in operation on January 14, 1920, and the flat-rate additions on traffic generally are to be reduced in accordance with the reductions recently announced by the English and Welsh companies.

The London and South Western Railway in South Hants and South Dorset.

WITH reference to the article published in the August RAILWAY MAGAZINE under this title, Mr. G. B. Drew, of Southampton, points out that although the working of trains at Bournemouth Central station was, until June 17 last, as described, important changes have since been made. The express trains from London to Weymouth are now formed so that the Weymouth portion is in front and the Bournemouth West portion at the rear. The train engine is not detached at Bournemouth Central station, but continues with the Weymouth portion to Dorchester, where engines are changed, another engine—which may be a 0-4-4 tank, an Adams or Drummond 4-4-0, or a 0-4-2 mixed-traffic tender engine—taking the train on to Weymouth. In the opposite direction the main line engine is attached at Dorchester and takes the Weymouth portion to Bournemouth Central, where it runs through the middle road and backs on to the section from Bournemouth West already in the station, the Dorchester engine working through to Waterloo. The principal express trains to and from London are now hauled by superheated engines of the 463 and 415 classes. There are now seven main line engines at Dorchester shed, the turntable there having been enlarged so that they can be dealt with. Mr. Drew mentions that, in the case of the first up express in the morning, the main line engine works a local train from Dorchester to Weymouth tender first, and in that instance makes a complete journey from Weymouth to Waterloo. The change in methods has materially lessened the journey time for Weymouth passengers in that only 5 or 6 min. are spent at Bournemouth Central instead of 12 or 15 as formerly. The mileage of the main line engines is also increased, while their use over the Bournemouth–Dorchester line, by no means an easy section, has considerable value when loads are heavy. In some instances, engines are changed at Bournemouth Central to fit in with the arrangement of engine duties, but, even when that is the case, "463" or "415" class engines are used between Bournemouth and Dorchester. Mr. Drew also points out that the run of 15 miles between Dorchester and Wareham is covered by up trains in 17 min. start to stop, average 52·94 m.p.h.

In regard to the same article, "Boscombe" points out that on page 118 the Salisbury–Ringwood line is mentioned in error for the Salisbury–Wimborne line, as will be obvious from the map. He suggests that had the Salisbury–Dorset line been connected at Ringwood instead of at Wimborne, it would

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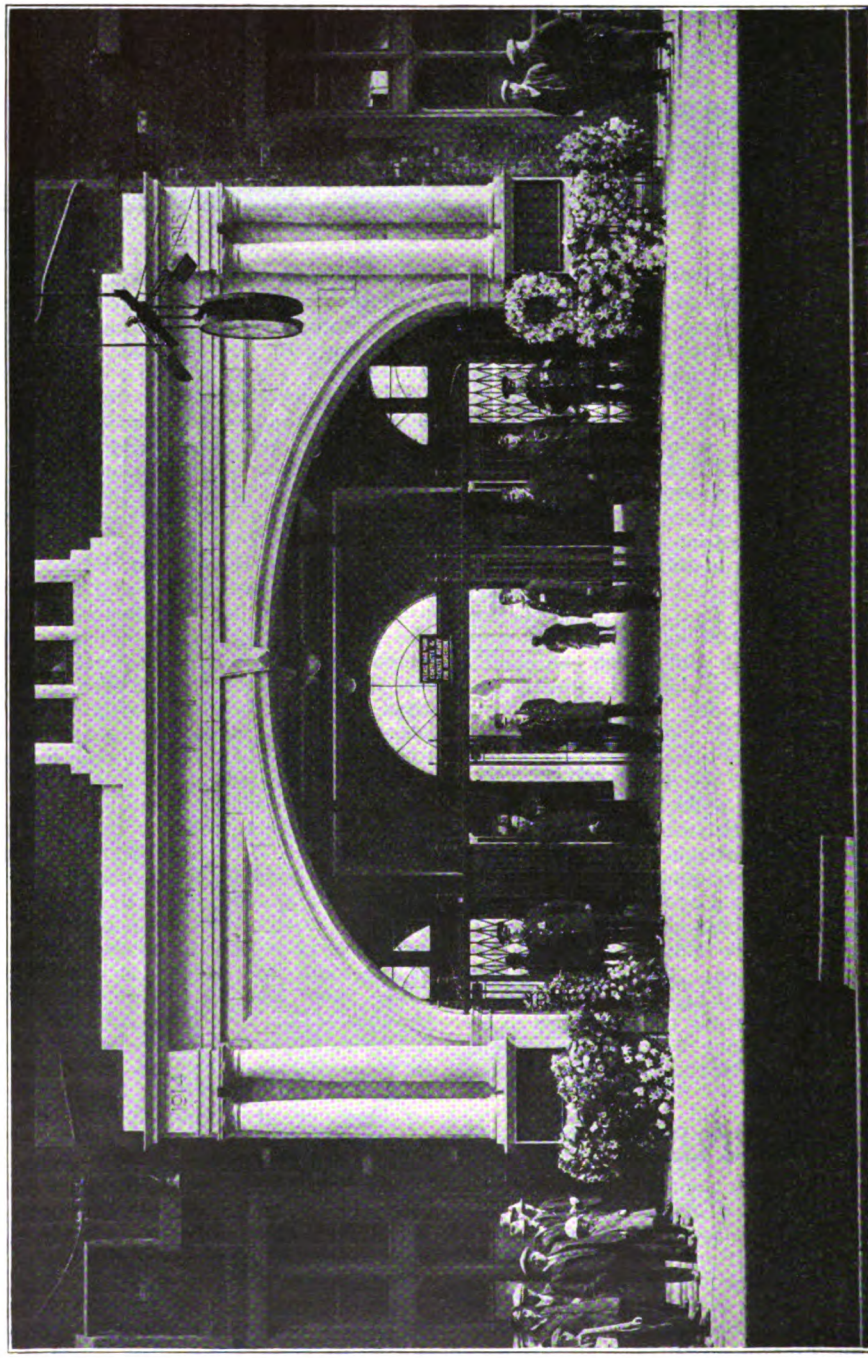

NORTH STAFFORDSHIRE RAILWAY WAR MEMORIAL AT STOKE.

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have been possible to run a through service from Salisbury to Bournemouth Central or West via Ringwood and Hurn, saving considerable mileage as compared with the present very circuitous route via West Moors and Broadstone Junction. He also mentions that the gradient into Bournemouth West station is 1 in 90 and not 1 in 60, as stated; also that there is now only one Bournemouth–Ringwood local train each way, travelling from the West station via Bournemouth Central and Christchurch, and that only one down and two up trains on the Weymouth and Swanage line travel via the Hamworthy–Broadstone direct line, apart from the train conveying the Swanage-Manchester through coach in each direction, and one or two Hamworthy – Wimborne locals. "Boscombe" further comments upon the peculiar topography of the lines in the Bournemouth district. In making the journey of 3¼ miles between Bournemouth Central and West stations, the train starts in Hampshire, just skirts inside the Dorset boundary, from the western end of Talbot Woods to a little south of Bournemouth West Junction, where it re-enters Hampshire, in which county the West station is wholly situated. He suggests that this is one of the most curious short railway journeys in the country, as in addition to the feature mentioned above, one practically "boxes the compass" in the space of an 8 minutes' run.

Unveiling of War Memorial at Stoke, North Staffordshire Railway.

On Tuesday, August 15, in the presence of a large gathering, a memorial arch erected at Stoke station, North Staffordshire Railway, in memory of North Staffordshire railwaymen who laid down their lives during the great war, was unveiled by the Chairman of the company, the Right Hon. Lord Anslow, C.B. Altogether 1,423 North Staffordshire Railway men, representing 25 per cent. of the entire staff, served in His Majesty's Forces during the war, and of that number 146 were killed or died during their service. The memorial takes the form of a finely-proportioned arch spanning the main entrance to the station platforms from the new booking hall. The arch, which is supported on each side by double pillars, is of Hollington stone, from the quarries of Stanton & Bettany, and surmounting it is the following inscription :—

1914–1918.

In Memory of the Men of the North Staffordshire Railway who fell in the Great War.

At the bases of the pillars are two handsome bronze tablets bearing the names of the fallen in raised lettering, the names on each tablet being arranged in five columns. Below is a complete list of the names of the men commemorated by the memorial, together with the branches of the Services in which they fought.

Attending the ceremony were several hundred relatives of the men who had fallen, together with a large number of present members of the staff. The following directors of the company were present :—

Lord Anslow (Chairman), Major Frank H. Wedgwood (Deputy Chairman), Mr. R. Fane de Salis, Mr. W. Morton Philips, Lieut.-Colonel Sir Thomas A. Salt, Bart., D.S.O., Mr. W. D. Phillipps, Colonel A. H. Heath, and Major F. W. Peacock, C.B. The Earl of Harrowby was unavoidably prevented from attending.

Among the chief officers of the company at the ceremony were :—

Mr. F. A. L. Barnwell (General Manager), Mr. R. E. Pearce (Secretary), Major C. G. Rose (Engineer), Mr. J. H. H. Bailey (Chief Goods Manager), Mr. J. F. A. Jones (Accountant), Mr. J. A. Hookham (Locomotive, Carriage and Wagon Superintendent), Mr. E. D. Grasett, O.B.E. (Traffic Superintendent), Mr. H. Curbishley (Canal Engineer), Mr. A. F. Rock (Telegraph and Electrical Superintendent), Mr. J. P. Woodworth (Cashier), and Mr. W. H. Stevens (Stores Superintendent). Other officials also attended in large numbers.

The gathering also included Lady Stanier (widow of the late Sir Beville Stanier, M.P., who was Deputy Chairman of the company); Mrs. Frank H. Wedgwood, Mrs. Barnwell, Mrs. Bill (widow of the late Colonel Bill, who was a director of the company), the Rev. M. Tron, D.S.O., M.C.; wives of officials, relatives and friends of the fallen, and deputations of ex-Service men from all departments of the company.

Shortly before 10.15 a.m., the hour fixed for the unveiling ceremony, a detachment of ex-Service men marched to a reserved space in front of the memorial arch. In opening the proceedings, Major Frank H. Wedgwood (Deputy Chairman of the company), in the course of an appropriate speech, briefly outlined the war record of North Staffordshire Railwaymen, upon 62 of whom honours had been conferred.

Major Wedgwood then read out the names of those who had given their lives, and called upon Lord Anslow to perform the unveiling ceremony. After drawing aside the Union Jacks which covered the bronze panels and the inscription over the arch, Lord Anslow made an impressive speech. Dedicatory prayers having been offered by the Rev. M. Tron, the "Last Post" and "Réveillé" were sounded. When the last notes of the "Réveillé" had died away, Mr. R. Fane de

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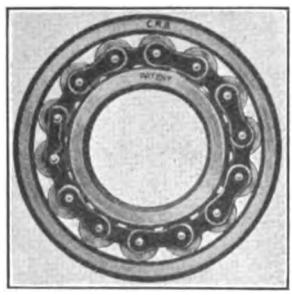
Salis laid the directors' wreath beneath one of the commemorative panels, and under the panel on the opposite side of the arch Mr. F. A. L. Barnwell placed the wreath from the General Manager and officers of the company. The playing of the National Anthem by the British Legion Imperial Military Band, under Deputy Bandmaster W. Henshall and the pronouncement of the Benediction by the Rev. M. Tron, brought to a close a memorable ceremony. Afterwards the detachment of ex-Service men lined up in Station Square. There they were inspected by Lord Anslow, who paused to exchange a few friendly words of greeting with each man on parade.

Roller Bearings for Railway Rolling-Stock.

UNDER the direction of Mr. F. V. Russell, now a special assistant to Sir Henry Thornton, General Manager, extended tests of a design of roller-bearing for railway vehicles, prepared by the Chain Roller Bearing Company, Limited, of Heaton Norris, Stockport, are being carried out by the Great Eastern Railway. It has long been recognised that a satisfactory and reliable design of roller or ball bearing for use on railway vehicles would enable very great economies to be attained in the reduction of train resistance, ease of running and consequent possibilities of savings in haulage costs, due to lessened fuel consumption and the fact that frequently one locomotive could work a train unaided, whereas ordinarily an assistant engine would have to be provided. In the design under trial the bearing includes a series of rollers of particularly hard but not brittle steel, mounted in a chain-type carrier, and arranged to run between two annular members, one surrounding the axle and the other fitted into the axlebox. In yard tests a stationary 27-ton vehicle could be moved by one man, on level track. Further tests to cover various traffic circumstances, and to show whether the rollers will withstand continuous service conditions, are to be carried out, as these results will naturally constitute governing factors in deciding upon the general adoption of this or other equipment of the same class as a standard feature in rolling-stock construction.



ROLLER BEARINGS FOR RAILWAY COACHES.

Chain Roller Bearing Company, Limited.

This bearing is claimed to give an exceptionally high load-carrying capacity, combined with a minimum of friction. The rollers are of the largest diameter permitted by the dimensions of the bearing to which they are applied, held in position axially by links of the pattern used for transmission roller chains. One link in each set is fitted with a spring fastener designed to permit of disconnection if required in the course of maintenance. The races are manufactured by a special process whereby a circumferential grain of the metal is produced, increasing toughness and durability. We understand that the cost of a set of rollers complete, with the inner and outer races therefor, is relatively low in view of the advantages to be realised.

The Trans-Australian Railway.

Two Australian readers, Mr. A. A. Bowles and Mr. C. F. Dewey, both of Sydney, send lengthy communications suggesting that the article under this heading, published in the April, 1922, RAILWAY MAGAZINE, is somewhat out of date in several respects and includes a number of inaccuracies. We may say that the article was supplied from official sources, and that possibly some of the criticisms advanced by our correspondents are due to differences in the point of view, and to changes produced by the lapse of time between the preparation of the article and its publication. At the same time, we are pleased to pass on to our readers some of the notes contributed by the two gentlemen named.

It is first pointed out that the dining car illustrated is not one of those used with Trans-Australian trains, but is one belonging to the Western Australian Railways (3 ft. 6 in. gauge) which connect with the Trans-Australian line at Kalgoorlie. Dining cars on the Trans-Australian Railway, as originally placed in service, have clerestory roofs, but new vehicles are now being constructed having roofs of elliptical type. Our correspondents take exception to the journey from Adelaide to Perth being described as "across the continent." This appears to be rather quibbling about terms, as this represents a distance of nearly 1,700 miles, more than half of the rail distance separating Perth and Sydney, while the complete journey to Brisbane is 3,488 miles. In any event, Adelaide may be considered as the western extremity of the more populous and

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industrial portion of Australia, so that once Adelaide was connected by rail with Western Australia, communication became available with Melbourne, Sydney and Brisbane.

Our correspondents mention that the ordinary goods service consists of a weekly train each way over the Trans-Australian line, conveying supplies and some 300,000 gallons of fresh water in water trucks for distribution *en route*. It also carries stores and live-stock for staff employed along the route, a special " slaughtering truck " being attached for providing fresh meat. Occasionally an additional goods train is worked, but, so far, there is very little ordinary freight and live-stock traffic over the line. As, however, the line has been built largely with a view to the future and for development, we are not surprised to learn that as yet the goods and live-stock traffic is not heavy, but, obviously, this must follow in due course, and especially if and when unification of gauge is realised in Australia. Our correspondents also mention that the Westinghouse brake is standard on the Commonwealth Railways, including the Trans-Australian, though the vacuum is used in Western Australia. Locomotives and rolling-stock of the Trans-Australian Railway are fitted with M.C.B. automatic couplings.

Trans-Australian Rolling-Stock.

THE standard make-up for Trans-Australian trains, from the engine, is : mail van, 2 second sleeping cars, dining car, lounge car, 3 first-class sleeping cars, and brake van. The passenger locomotives are of the 4-6-0 type (Class " G "), with 20-in. by 26-in. cylinders and 5-ft. coupled wheels, weighing, in working order, 99 tons. The goods locomotives are of the 2-8-0 type (Class " K "), with 22-in. by 26-in. cylinders and 4 ft. 3 in. coupled wheels, weighing, in working order, 117 tons. The former are identical with the " P " class locomotives of the New South Wales Government Railways. Sleeping and dining cars weigh 35 tons each, and are built of Australian timbers on steel underframes. Length over couplings is 65 ft., width 9 ft. 9 in. ; and height inside 8 ft. 10½ in. The first-class sleeping cars are of corridor type, and contain eight 2-berth cabins, with an extra cabin containing a berth for the conductor. The second-class sleeping cars differ only in internal construction. Of the two included in each train, one has seven 4-berth cabins and the other five 4-berth cabins and a saloon for day use. The dining cars seat 30 passengers, but new vehicles now being placed in service will accommodate 40. The brake van contains eight berths for the three cooks, three waiters and two second-class sleeper conductors ; also accommodation for the guard. It weighs 26 tons and is 43 ft. long. The lounge car weighs 27 tons and is 51 ft. long. A feature of the train is the provision of electric light and fans throughout, bath-rooms, and a news service.

With reference to the illustration of a camp train, reproduced on page 268 of the April, 1922, RAILWAY MAGAZINE, Mr. Dewey points out the bodies of these vehicles have now been removed and the underframes utilised for the construction of standard passenger stock. Included in the goods rolling-stock in use on the line, which numbers about 100 vehicles, are some fine examples of two-storey bogie sheep trucks. According to the latest time-table available, Western Australian Government trains leave Perth at 9 p.m. Mondays, Thursdays and Saturdays ; Trans-Australian trains leave Kalgoorlie at 2.15 p.m. Tuesdays, Fridays and Sundays. Port Augusta is reached at 5 a.m. Thursdays, Sundays and Tuesdays ; Adelaide at 7.50 p.m. Thursdays, Sundays and Tuesdays ; Melbourne at 1.3 p.m. Fridays, Mondays and Wednesdays ; Sydney at 10.45 a.m. on Saturdays, Tuesdays and Thursdays ; and Brisbane at 6.40 p.m. Mondays, Wednesdays and Fridays. In the opposite direction, trains leave Brisbane at 8.5 a.m. on Saturdays, Mondays and Thursdays, and Perth is reached at 9.47 a.m. on Fridays, Sundays and Wednesdays. Trains have, of course, to be changed at Kalgoorlie, Port Augusta, Terowie, Adelaide, Melbourne, Albury, Sydney and Wallangarra in making the complete journey between Perth and Brisbane. From Perth to Adelaide (1,686 miles), occupies 69¼ hours ; thence to Melbourne (483¼ miles) 16 hours ; onwards to Sydney (591½ miles), 17¾ hours ; and thence to Brisbane (715 miles), 27¼ hours.

Since the construction of the Trans-Australian Railway, considerable areas have been placed under pastoral occupation within 100 miles on each side of the line, especially in Western Australia, and for 200 or 300 miles from Port Augusta.

More about the Trans-Australian Railway.

AFTER the foregoing paragraphs had been written, we received from the Secretary of the Department of Works and Railways for the Commonwealth Railways of Australia, on behalf of the Commissioner, several further comments and additional information (which we have pleasure in giving), together with several photographs, one of which is now reproduced. In several respects the information now supplied goes beyond the ground covered by the article and will be of special interest for that reason.

In the article it was stated, in regard to the inferior water on the Trans-Australian Railway, that the dams and reservoirs contain

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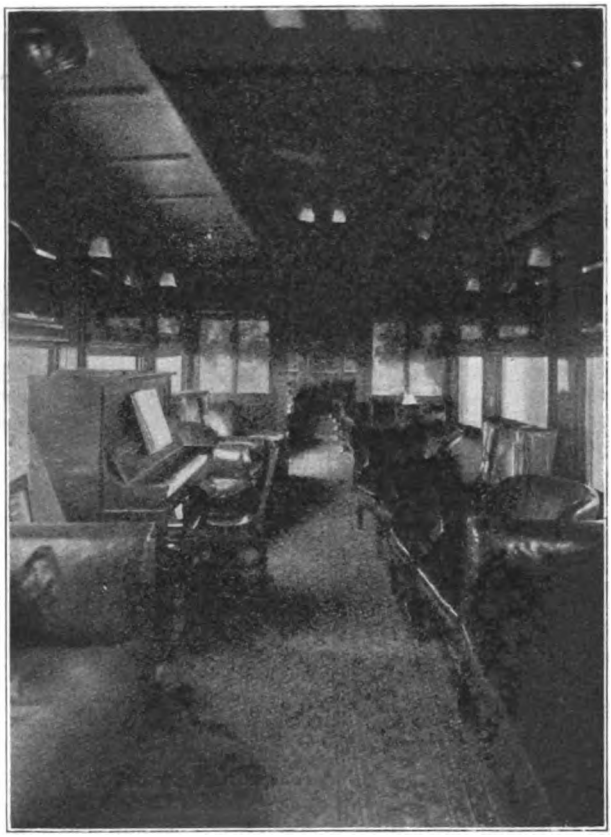

A PIANO IN A RAILWAY CAR.
Lounge Car, Australian Trans-Continental Railway.

water unfit for human consumption. As a matter of fact, the surface water in the reservoirs is of excellent quality and is used throughout the line for domestic as well as for locomotive purposes. Most of the well and bore waters, however, contain a high percentage of solids, causing very serious trouble to locomotive boilers. Some of this water contains as much as 34 grains per gallon of magnesia, and so far all experiments with analysis and softening processes have failed to overcome the trouble. On the other hand, the water in some of the wells is quite fit for drinking purposes.

Special rolling-stock has been constructed for the through passenger trains. This consists of first and second-class sleeping cars, accommodation for sleeping being provided for all through passengers as the journey between Port Augusta and Kalgoorlie involves two nights on the train. The normal train consists of nine cars, comprising mail van, two second-class sleeping cars, dining car, lounge, three first-class sleeping cars and brake van, making a load of approximately 400 tons. The whole of the rolling-stock is equipped with Westinghouse brake and automatic centre couplers.

New Cars "de Luxe."

All the latest passenger car stock was built in the departmental shops at Port Augusta, South Australia, the eastern terminal of the railway. The underframes are of steel, bodies of wood. The interiors are finished with Australian ornamental timbers, such as blackwood, cedar, Australian oak and Queensland maple. The total length over-all of the latest design of first and second-class cars is 79 ft. 5 in.; width, 10 ft. 1 in. over-all; height from rail, 14 ft. 2 in., mounted on 4-wheeled bogies; distance between bogie centres, 56 ft. 6 in.; wheel-base, 8 ft. In each of the first-class cars there is accommodation for 20 passengers and the conductor. Lavatories and bathroom (with shower) are provided. Compartments contain two berths, upper and lower, arranged across the car, and are fitted with wardrobes, wash-basin, electric fan and reading lights. The second-class cars provide accommodation for 34 passengers and conductor. The compartments contain four berths and the wash-basins are in a centre compartment of the car, and ladies' and gentlemen's lavatories respectively are provided at each end of the car. The whole train is equipped throughout with electric light. The water supply for the train is carried underneath the car and reticulated by air pressure.

The dining car service is up-to-date in every respect, and caters for the travelling public with a service comparable with that of a leading hotel. Early morning tea is served in the sleeping compartment, and afternoon tea in the lounge car. The lounge car, available to all first-class passengers, is coupled next to the dining car, and is replete with every comfort for the long journey of 1,051 miles. Passengers may seek relaxation at the writing tables, card tables, &c. Magazines are available for sale and books are obtainable from the library provided in the car. The piano in the lounge car is an original feature and musical entertainments are often arranged.

The locomotives at present in use are of the 4-6-0 type, with a tender capacity of seven tons of coal and 4,500 gallons of water. Cylinders, 20 in. diam. and 26 in. stroke;

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boiler pressure, 160 lb. per sq. in.; tractive power, 22,200 lbs.

A special service car, which is entirely self-contained, may be hired by parties of eight persons or less, at a very reasonable amount above the ordinary first-class fare. In the car are two " de luxe " bedrooms, handsomely appointed and separated by folding doors. During the day these bedrooms can be used as a lounge. In each bedroom are wardrobe, wash-basin, folding bed, small table, and easy chairs. There is a full-sized bathroom replete with every modern appliance; complete hot water service throughout the car is installed. Three two-berth compartments are also provided, and, of course, kitchen and accommodation for two attendants. At the trailing end of the car is a saloon suitable for dining purposes and fitted with radiators, ice chests, electric bells and four high-speed fans. This saloon opens on to an observation platform.

The railway affords through communication by a first-rate passenger service from Fremantle and Perth to the Eastern capitals, Adelaide, Melbourne, Sydney and Brisbane. The services of the various State railway systems maintain connection so that one may travel across the Continent from Perth to Melbourne in three and a-half days, as against six days by steamer.

The up-to-date and comfortably appointed sleeping and dining accommodation provided on the Trans-Australian Railway makes the overland trip popular with overseas visitors, who, on their way to the Eastern States, are afforded an unique opportunity of viewing the interior of the Continent.

Complicated Junctions.

REFERRING to the article in the August RAILWAY MAGAZINE on " The North Western Electric," " Boscombe " suggests that the complexity of the system of " under and over " connections at Chalk Farm is paralleled, if not excelled, from the point of view of the numbers of non-fouling connections between routes which can be made by the London, Brighton and South Coast Railway Junction in the Norwood–Selhurst–Croydon area. We quite agree as to the peculiar interest of the " Croydon Maze " (which was, by the way, fully described in the RAILWAY MAGAZINE for September, 1920). At Chalk Farm, however, the problem was to make the connections within a very limited area, whereas in the Croydon district the connections cover a relatively extensive range. Incidentally, while all the principal junctions there are of " flying " or " burrowing " character, a number of surface junctions are also involved. " Boscombe " also mentions that the basis of the Croydon system of lines was laid out, substantially as at present, in relatively early days about the 'sixties—and he suggests that it would be interesting to know under whose direction this system of lines was laid out at the time. We have not this information to hand, but possibly some reader familiar with early " Brighton " history can supply the desired particulars.

Locomotive and Train Working in the Latter Part of the 19th Century. Highland Railway.

" A. D. C." writes, in reference to Mr. Ahrons' recent articles under this heading, pointing out that in the September, 1921, RAILWAY MAGAZINE, the names of certain locomotives should be as follows:—No. 3, *Ben Wyvis*; No. 66, *Arduuela*; and No. 123, *Loch an Dorb*, thus correcting clerical errors in transcribing the names of these locomotives. The same correspondent also mentions that No. 70 is still at work as No. 70A, her place as No. 70 having been taken by *Loch Ashie*. He also mentions a curious feature of the train service on the Skye Line. On Wednesdays and Fridays the train due at Dingwall at 7.40 p.m. leaves Kyle of Lochalsh at 5.10 p.m., but on other days leaves 40 min. earlier, though it is due at Dingwall at the same time. The explanation is that the train is usually " mixed," but on Wednesdays and Fridays during the summer it is run as an ordinary train, allowing an additional 40 min. at Kyle of Lochalsh.

" Checked " Luggage on the London and South Western Railway.

Reference was made in the May, 1922, RAILWAY MAGAZINE, to the introduction by the London and South Western Railway Company of a system of " checked " luggage conveyance, brought into operation on April 5 last. By means of this system, passengers' luggage is conveyed, in accordance with the arrangements which apply to luggage accompanying passengers, in such a way that passengers are relieved from all responsibility in regard to despatch, transhipment *en route*, and delivery. Several variations of conditions are provided for so that, in effect, passengers need no longer concern themselves with the details of the conveyance of their luggage, whatever their requirements may be. All that is required after having purchased the necessary tickets, which may be ordinary, season, tourist, excursion (other than day or half-day), week-end or privilege tickets, is to instruct the company's carman to call, or to give instructions at a station, and to pay a checking fee of 1s. per package, for which the passenger receives a duplicate portion of a special luggage check, which constitutes a voucher to be handed back at destination or when

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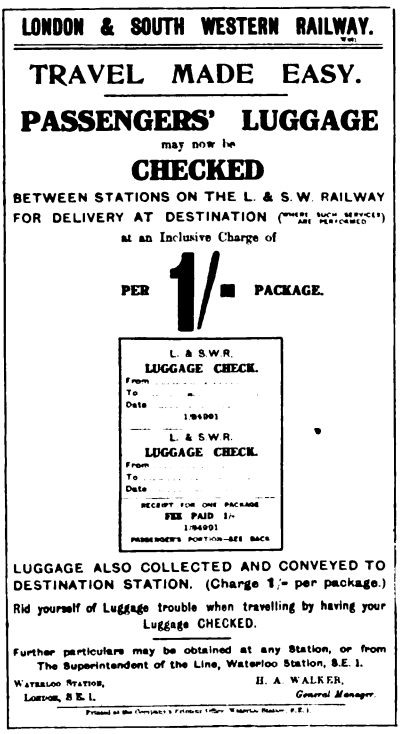
claiming luggage at a station or cloak room.

Posters and handbills headed "Travel made Easy," have been issued to advertise the system, and one of the handbills is reproduced. The arrangement applies to all classes of passengers' luggage which come under the usual "accompanied" arrangements, including cycles (not motor), mail carts, golf clubs, cricket bags, &c., and commercial travellers' luggage. It also applies when excess or special charges are due, as when luggage is conveyed under the passenger's own care, and the system includes


LONDON & SOUTH WESTERN RAILWAY.

TRAVEL MADE EASY.

PASSENGERS' LUGGAGE

may now be

CHECKED

BETWEEN STATIONS ON THE L. & S.W. RAILWAY FOR DELIVERY AT DESTINATION (WHERE SUCH SERVICES ARE PERFORMED) at an Inclusive Charge of

PER 1/- PACKAGE.

L. & S.W.R.
LUGGAGE CHECK.
From
To
Date
1/64001

L. & S.W.R.
LUGGAGE CHECK.
From
To
Date
RECEIPT FOR ONE PACKAGE
FEE PAID 1/-
1/64001
PASSENGER'S PORTION—SEE BACK

LUGGAGE ALSO COLLECTED AND CONVEYED TO DESTINATION STATION. (Charge 1/- per package.)

Rid yourself of Luggage trouble when travelling by having your Luggage CHECKED.

Further particulars may be obtained at any Station, or from The Superintendent of the Line, Waterloo Station, S.E. 1.

WATERLOO STATION, LONDON, S.E. 1.

H. A. WALKER, General Manager.

REPRODUCTION (ON A SMALL SCALE) OF POSTER AND HANDBILLS ADVERTISING THE NEW FACILITIES.

provision for both "Prepaid" and "To Pay" charges due to excess over the authorised free allowances and in regard to cycles, mail carts, &c., for which additional charges have to be paid.

Necessarily, the system is at present confined to London and South Western Railway stations, including Ryde via Portsmouth and Yarmouth via Lymington (but not to and from Cowes and other stations in the Isle of Wight, the Channel Islands or French ports). Correspondingly, it does not apply for delivery to certain unimportant stations at which the company does not perform cartage services, where passengers must make their own arrangements for delivery, as was the case before this system was introduced. At all important centres, however, on the London and South Western Railway, it is operative, while to some extent it replaces the arrangements for the conveyance of passengers' luggage in advance, though that still applies to the London and South Western Railway, particularly where stations upon another railway are concerned. The checked luggage system, with the reservations noted, applies under three conditions: (*a*) For collection or delivery only; (*b*) For collection and conveyance to destination station only, or between station and station; and (*c*) For conveyance to home station and delivery only.

Special Labels in Use.

FOR checking purposes numbered checks or labels are supplied, one portion of which is affixed to the package or article by the station staff or, in the case of luggage collected from private houses, offices, hotels, &c., by the carman, and the duplicate portion handed to the passenger at the time of acceptance. These checks are marked to facilitate differentiation and identification at a glance, the following being the official description:—

Check A.—In duplicate, colour white.	For use on luggage collected or delivered only (*i.e.*, not conveyed by rail).
Check B.—In duplicate, colour yellow.	For use on luggage collected by the company or handed in at stations, intended to be claimed at destination station.
Check C.—In triplicate, yellow with a green bar on each side of each portion.	For use on luggage collected by the company or handed in at stations, intended to be claimed at destination stations, upon which excess charges have been paid.
Check D.—In duplicate, yellow with a red bar on each side of each portion.	For use on luggage collected by the company intended to be claimed at destination station, upon which excess charges are due for collection at destination.
Check E.—In duplicate, blue.	For use on luggage handed in at stations for conveyance and delivery home.
Check F.—In triplicate. blue with a green bar on each side of each portion.	For use on luggage handed in at stations for conveyance and delivery home upon which excess charges have been prepaid.

In the case of luggage checked for conveyance by rail, collection or delivery is

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undertaken within the usual free cartage areas by the company, if required, without extra charge, the checking fee being inclusive of this service. The ordinary additional charges are made for traffic carted beyond the free boundaries.

A collecting carman is required to endorse the tickets of intending passengers whose luggage he has collected with the letters "C.L.," at the same time affixing his portion of the check to each package and handing the duplicate to the passenger, or this work is done at the station where luggage is handed in. When cycles, perambulators, &c., are conveyed, excess checks "C" or "F" only are used. The "To Pay" Excess Check "D" is designed to meet the condition when it is found, after weighing "Collected" luggage at the forwarding station, that excess charges are due.

Electric Traction on the Swiss Federal Railways.

REFERRING to the notes under this heading, published in the August RAILWAY MAGAZINE, one of our readers resident in Switzerland, Mr. F. G. Williamson, points out that the engine actually used for the train conveying the King of the Belgians was No. 10304, having the 4-6-2 wheel arrangement. Of these engines there are, as yet, only eight in service, Nos. 10301-8, all being stationed at Berne except No. 10304, which is at Goeschenen. No. 12312, he points out, is of the 2-4-0-4-2 type. In regard to remarks as to the running of this special train as "being better than the best regular run in Switzerland, viz., Geneva-Lausanne at 40·5 m.p.h. over undulating gradients of 1 in 100 or easier," Mr. Williamson suggests that Mr. Miller has presumably overlooked the train service between Berne and Thun. "The fastest run in Switzerland is performed daily over this length by the 1.48 p.m. express from Berne to Milan, via the Loetschberg and Simplon tunnels. This train is allowed 25 min. start to stop for the 18½ miles = 44·4 m.p.h. The train generally consists of 12–13 large passenger coaches (6 or 8 wheelers) and a luggage van, and is hauled by one of the electric 4-6-2 locomotives above mentioned. The line rises more or less steeply for the first 7 miles and then falls gently to Thun. With severe curves and service slacks (speed never exceeds 20 m.p.h.) for the first 3 miles, this is no easy feat with so heavy a train, above all since maximum speed is limited to 90 km. p.h. = 56·025 m.p.h. This run is also performed by the 6.17 p.m from Thun to Berne."

Unusual Rolling-stock Combinations.

WITH reference to remarks published in the September RAILWAY MAGAZINE, Mr. G. W. Bishop mentions that trains consisting of North London Railway coaches painted in London & North Western colours are frequently to be seen in the Leamington district. He states that when first used they ran in the varnished teak characteristic of the North London Railway, and compared very unfavourably with the usual London & North Western bogie stock. Painted "in Wolverton style, however, they look very smart, the raised look-outs at each end giving a distinctive effect." Mr. Bishop continues: "It is singular to see one of these neat little trains behind a 'Precursor' or a 'Prince,' as sometimes happens, though very often they are pulled by the 18 in. 0–6–0 goods class. The trains run very well for four-wheeled stock. Sometimes they are combined with large corridor coaches. They are labelled Leicester and Leamington at each end. . . . Formerly the Leamington-Nuneaton and Nuneaton-Leicester services were kept quite apart in the time-tables, but are now combined as a continuous route."

The Institution of Locomotive Engineers in South America.

ALTHOUGH situated so far from the parent body that it is apt to be overlooked, the South American branch of the Institution of Locomotive Engineers is not the least active of its branches and, under the fostering care of its president, Mr. M. F. Ryan, C.B.E., Chief Mechanical Engineer of the Central Argentine Railway, is making tremendous headway in Latin-America. Since it was founded in June, 1920, a most fruitful series of meetings and excursions have been held, and not the least interesting was the visit recently paid by some 73 Argentine and Uruguayan members of the Institution to the railway and engineering establishments of Chile.

Setting out from Buenos Ayres on February 16, members had the prospect of nearly 4,000 km. of railway travel in front of them before their trip would be completed. By the kindness of the Buenos Ayres and Pacific Railway Company a special train, composed of five sleeping cars and one dining saloon, was placed at the disposal of the travellers to convey them over the plains of Argentina. At Mendoza, after a 22-hours journey, a change was made to another special train, generously placed at the disposal of members by the Transandine Railway Company, for the crossing of the Andes. On this line, for hours there is a grade of 5 and 6 per cent. until a height of 10,560 ft. is reached. Arriving at Los Andes a change was made to the Chilian State Railway. At this point members were welcomed by Señor Jaramillo, the Chief

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Mechanical Engineer of the State lines, who had kindly arranged to place two special coaches at the disposal of the travellers. The Chilian Railway has a gauge of 5 ft. 6 in. and the train speed was found to be much faster than in the Argentine, the average being 85 km. per hour and often reaching as high as 95 km. Santiago de Chile was reached at midnight on February 17 after a continuous train journey of 39 hours.

The programme to be carried out in Chile started on Saturday morning, February 18, with a meeting held in the lecture room of the Institute of Chilian Engineers. In the afternoon a special train conveyed the visitors to La Calera to inspect the cement works there. Sunday was spent at Florida where, at the invitation of the Chilian Electric Light and Tramway Company, an inspection was made of the hydro-electric power station.

This power house will generate 35,000 kw. and power will be supplied from that to the first section of the Chilian State Railways electrified lines.

Chilian Railway Workshops.

LEAVING the Alameda station on Monday at 8 a.m., a visit was paid to the principal railway shops of the Chilian State Railways. These shops, which are situated in San Bernando, are most modern and up to date. Accompanied by the Chief Mechanical Engineer and some members of his staff a thorough inspection of the shops was made. It was evident that the planning of the shops was done with a view to the construction of locomotives as well as repairs, whereas the Argentine Railway shops are designed and equipped for repair work only. Here was seen a locomotive which, with the exception of the tyres, wheels and frame, had been built in these shops, and many of the older class of engines had been entirely reconstructed, and many improvements and modifications of the original design carried out, resulting in very serviceable engines. The actual number of men employed at the time of the visit was 900, although the capacity of the shops is very much greater, as, like the Argentine, Chile is passing through a period of trade depression. The average output from general repair is 10 engines per month. During the afternoon a visit was paid to the steel foundry of the Cia. Electro Metalurgico, in Santiago. This company supplies all the steel castings required by the State lines. On Tuesday a three-hour train journey was made to Valparaiso. During the first part of the afternoon an inspection of the Chilian railway shops was carried out. Wednesday was the last day in Chile and, to complete the programme, a visit was paid to the port works of San Antonio. Lunch, served in the Grand Hotel, was the last meal taken by members with their very hospitable Chilian friends, and advantage was taken of this by Mr. Mayne, Secretary of the South American Branch of the Institution of Locomotive Engineers, to thank their Chilian colleagues for the extremely kind way in which the members had been received, and to express the hope that the time was not far distant when the visitors of to-day would be the hosts. Señor Jaramillo, in a very eloquent speech on behalf of the Chilian engineers, said that he was of opinion that such an interchange of views as had taken place between them was all to the good, and he hoped that this would not be the last visit of members of the Institution of Locomotive Engineers.

August Traffic at Blackpool.

IT is doubtful whether any two stations serving one pleasure resort, either in this country or abroad, are used during the holiday season by numbers of passengers approaching those recorded at the Central and Talbot Road stations, Blackpool, London & North Western Railway. For that reason special interest attaches to statistics kindly furnished by Mr. Ashton Davies, General Superintendent, Northern Division, London & North Western Railway. These include all stations in the Blackpool area, but at least 90 per cent. will relate to the stations mentioned. Corresponding statistics for 1920 and 1921 are given, and it will be seen that although 1920 is regarded as a boom year its records have this year been exceeded very considerably. A similar table is also given of the Saturday totals.

WEEKLY FIGURES.

Week ending	1922.	1921.	1920.
August 5 ..	107,495	97,985	107,439
,, 12 ..	124,534	110,501	111,258
,, 19 ..	108,970	91,135	97,633
,, 26 ..	87,541	86,403	80,840
September 2 ..	105,515	91,959	102,887

SATURDAY FIGURES.

	1922.	1921.	1920.
August 5.. ..	74,475	49,879	67,274
,, 12.. ..	77,022	51,948	64,640
,, 19.. ..	65,225	56,714	59,441
,, 26.. ..	52,081	48,838	34,815
September 2 ..	71,929	53,403	61,380

At the same time the outward traffic has also to be dealt with. For instance, on September 2 71,929 tickets were collected in the Blackpool area, and at the same time the large return traffic of Oldham Wakes, which approximately would represent 50,000 passengers, had to be dealt with; the position therefore being that over 120,000 passengers in and out of Blackpool district were handled The figures, of course, exclude season-ticket holders.

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MAJOR F. G. WRIGHT, M.I.Mech.E., Chief Assistant to the Chief Mechanical Engineer, Great Western Railway, retired on August 12. He entered the service as an apprentice in the Great Western Railway locomotive shops at Gloucester in July, 1876, under his father, the late Mr. T. H. Wright (one of the original pupils of the late Sir Daniel Gooch), and had, therefore, completed 46 years' service. In August, 1879, he was moved to Bristol, and three years later transferred to the drawing office at Swindon, where he became Chief Draughtsman in 1892. In 1896 he was made Assistant Manager of the locomotive works at Swindon; five years later he became Manager, and in July, 1903, was appointed to the post which he has now vacated. Major Wright's activities were by no means confined to the railway world. He took a keen interest in the public life of the town of Swindon. On the incorporation of the borough in 1900 the first Mayor was Mr. G. J. Churchward, who was succeeded by Mr. L. L. Morse, and the latter was followed by Major Wright. He was keenly interested in the Volunteer movement, and on the formation of the Territorial Forces in 1908 was instrumental in raising from the Great Western Railway works at Swindon the Fortress Company of the Royal Engineers, while simultaneously the Electric Light Company was formed at Weymouth. On the outbreak of war he was with these companies at Weymouth, where he did much good work. He retired in October, 1921, with the rank of major.

Photo.] [*Elliot & Fry.*

MAJOR F. G. WRIGHT, M.I.Mech.E.,

Chief Assistant to Chief Mechanical Engineer, Great Western Railway. 1903–1922.

* * *

MR. C. R. DASHWOOD, O.B.E. who has been appointed Assistant Accountant, Great Western Railway, was born on June 4, 1888, and commenced his career in the Locomotive and Carriage Department at Swindon in June, 1902, being transferred to the Chief Accountant's office in February, 1908. In April, 1916, he was appointed Bookkeeper, and in January, 1919, Assistant Accountant jointly with Mr. W. J. R. Wheeler in the Audit Section. Mr. Dashwood was Secretary to the Railway Accountant's Committee dealing with the Railway Companies (Accounts and Returns) Act, 1911, and to the Accountants' Permanent Committee which was set up when the former Committee ceased to exist. In August, 1914, he was made Secretary to the Accountant's Sub-Committee, and, from its inception, of the Compensation Accounts Sub-Committee of the Railway Executive Committee. He was appointed an Officer of the Order of the British Empire for his services in connection with the last-named Committee.

* * *

WE regret to record the sudden death at his residence at Abingdon, of Sir Frank Gore-Browne, K.C., President of the Railway Rates Tribunal; also of Mr. John Henry Rice, who retired two years ago from the

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position of Assistant General Manager of the North Staffordshire Railway, after a very lengthy service; and of Mr. J. Dalby, Chief Assistant to Mr. T. C. Jeffrey, Superintendent of Advertising, General Superintendent's Department, Midland Railway, Derby. We have further to announce the death at a comparatively early age of Mr. E. A. Watson, Managing Director, Messrs. Beyer, Peacock & Co., Ltd., and late Chief Mechanical Engineer, Great Southern and Western Railway, Ireland.

* * *

MR. W. A. STANIER, M.I.Mech.E., appointed Works Assistant to the Chief Mechanical Engineer, Great Western Railway, entered the service at Swindon in June, 1892, became a draughtsman in November, 1897, and in 1900 was appointed Inspector of Purchased Material. The next year he was given the post of Technical Inspector in the running shed at Swindon, and at the beginning of 1903 was appointed Assistant Locomotive Superintendent for the Swindon division. The following year he was transferred in a similar capacity to the London division, and two years later returned to Swindon as assistant in the management of the locomotive works. A few months afterwards he received the appointment of Locomotive and Carriage Superintendent of the Swindon division. At the beginning of 1913 he succeeded to the position of Assistant Manager of the Locomotive Works, becoming Manager in 1920.

* *

Mr. J. Auld, M.I.Mech.E., who has been appointed Docks Assistant to the Chief Mechanical Engineer, Great Western Railway, was formerly Chief Mechanical Engineer of the Barry Railway, whose service he entered as Locomotive Superintendent in 1910. Mr. Auld served his apprenticeship on the Glasgow and South Western Railway, and subsequently held appointments on the Great North of Scotland Railway and the London, Tilbury and Southend Railway, after which he returned to the Glasgow and South Western Railway as District Locomotive Superintendent at Glasgow. On the amalgamation of the Barry Railway Company with the Great Western Railway Company Mr. Auld was appointed Mechanical Engineer at Barry Docks and Divisional Locomotive Superintendent of the Cardiff Valleys Division.

Photo.] [*Elliott & Fry.*

MR. W. A. STANIER,

Works Assistant to Chief Mechanical Engineer, Great Western Railway.

MR. J. AULD,

Docks Assistant to Chief Mechanical Engineer, Great Western Railway.

* * *

MR. G. H. BURROWS, M.I.Mech.E., who now becomes Personal Assistant to the Chief Mechanical Engineer and Chief Draughtsman, Great Western Railway, entered the employ of the company in April, 1883, and served

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an apprenticeship at Swindon. After passing through the test house, he entered the drawing office in 1889. In 1896 he was transferred to the superintendent's drawing office, of which he became Chief Draughtsman in December, 1905.

* * *

MR. R. A. G. HANNINGTON, Manager of the Locomotive Works, Swindon, Great Western Railway, entered the service of the company as a pupil in the locomotive works at Swindon on October 12, 1903. He entered the drawing office in December, 1906, and was appointed Assistant to the Divisional Locomotive Superintendent, Swindon division, in 1909. In 1916 he was transferred to the London division as Assistant Divisional Locomotive Superintendent, and in 1919 was appointed Locomotive Superintendent of the Worcester division. Last July he was appointed Manager, Carriage and Wagon Works, Swindon.

* * *

MR. A. MAYNARD, who has been appointed Assistant to the Chief Goods Manager and Development Agent, Great Western Railway, has for the past four years been Goods Superintendent at Paddington. Born in 1882 and educated abroad, he started commercial life in a London shipbroker's office in 1899. Later he served in the South African War, and afterwards joined the staff of C. Shaw Lovell and Sons. Subsequently Mr. Maynard was engaged on the firm's behalf in France, Holland, Belgium, Scandinavia and Central Europe. He joined the Great Western Company's service as district agent at Nantes in 1909, and later was transferred to the Continental Department at Paddington. In 1914 he was made goods agent at Taunton, and held a similar position at Birmingham before his appointment to the goods superintendency at Paddington.

* * *

MR. E. T. J. EVANS, Manager of the Carriage and Wagon Works, Swindon, Great Western Railway, joined the service as an apprentice in 1896. Upon completion of his apprenticeship he served a short time in the shops, and in 1903 entered the drawing office. In 1916 he was made a Locomotive Factory Inspector, and three years later was appointed Assistant Divisional Superintendent at Wolverhampton. The following year he was made Assistant Manager of the Carriage and Wagon Works at Swindon.

MR. R. A. G. HANNINGTON.

Manager, Locomotive Works, Swindon, Great Western Railway.

MR. E. T. J. EVANS,

Manager, Carriage and Wagon Works, Swindon, Great Western Railway.

* * *

MR. H. R. PRIDEAUX, who has been appointed Assistant to the Chief Accountant, Great Western Railway, was born on

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January 1, 1870, and educated at the City of London School. He commenced his railway career in the Chief Accountant's office on February 25, 1886. He became Chief Clerk in 1916, prior to which date he had been successively in charge of the more important sections of the Chief Accountant's office. Mr. F. W. Page appointed Assistant to the Chief Accountant in charge of the Accounts of the Docks and Steamboats Section, Great Western Railway, was formerly Accountant of the Port Talbot Railway and Docks Company. He commenced his business career with the firm of Robert B. Byass and Co. After 10 years' service with that firm he joined the staff of the Port Talbot Railway and Docks Company in 1896, and previous to his appointment as Accountant of that company in 1898, held the position of Docks Collector.

* * *

A NUMBER of retirements and new appointments are officially announced on the Northern Counties section of the Midland Railway. This system, in the north of Ireland, was previously owned by the Belfast and Northern Counties Railway Company and was purchased by the Midland Railway Company in 1903.

Retirements as from September 30.

Mr. James Cowie, Secretary and Manager.

Mr. Bowman Malcolm, Engineer and Locomotive Engineer.

Mr. Francis G. Hopkirk, Assistant Engineer.

Appointments as from October 1.

Mr. James Pepper, Assistant Goods Manager, Midland Railway, to be Manager and Secretary.

Mr. William Kelly Wallace to be Engineer and Locomotive Superintendent.

Mr. F. W. Crofts to be Engineering Assistant to Mr. Wallace.

Mr. H. P. Stewart to be Mechanical Assistant to Mr. Wallace.

* * *

THE Permanent Commission of the International Railway Association has decided to hold the next Congress in London during the second half of the year 1925, in order that the Association might participate in the Centenary Anniversary of the first English railway. The Congress will probably be held in September, 1925—the Stockton and Darlington Railway was opened for traffic on September 7, 1825. Previously it had been arranged that the next Congress would be held in Madrid in 1927, but in view of the historic interest which will attach to 1925 the change is eminently suitable.

* * *

THE "Piccadilly" section of the London Electric Railway is to be extended from Hammersmith, its present terminus, to join the Metropolitan District Railway in order that trains may run through from Finsbury Park to Richmond and Hounslow. This work is covered by the London Electric Railway Act of 1913. From the present terminal platforms at Hammersmith (Broadway) used by "Piccadilly" trains, the two lines will be extended in "covered way" under Broadway and Beadon Road, parallel to the existing covered way used by Metropolitan District trains, to the point where these come into the open. Here the west-bound line will rise between the Metropolitan District lines and the London and South Western Railway alongside (at present almost disused), to join the latter lines adjacent to Ravenscourt Park station. The new east-bound line will leave the London and South Western section on a descending viaduct on the north side, and pass under the South Western viaduct to reach the covered way connecting with the present lines at Hammersmith. From Ravenscourt Park to Turnham Green, the London and South Western tracks, over which running powers will be exercised, are to be electrified and island platforms erected at Ravenscourt Park and Stamford Brook stations. Beyond Turnham Green the London Electric lines will be given terminal spurs for trains not proceeding further, and connections to the lines used by Metropolitan District trains, the existing system of inter-connecting and "burrowing" lines affecting both Metropolitan District and London and South Western lines being to some extent re-arranged to meet the needs of the new services.

* * *

IN order to meet the requirements of increasing traffic, and in view of contemplated new developments, particularly in reference to the "Piccadilly" section of the London Electric Railway, an order for 250 new cars is to be placed with manufacturers. Before this is done, however, the associated "Underground" companies have invited the co-operation of five of the leading rolling-stock construction firms, the Metropolitan Carriage, Wagon & Finance Company, Limited; the Gloucester Railway Carriage & Wagon Company, Limited; the Leeds Forge Company, Limited; the Birmingham Railway Carriage & Wagon Company, Limited; and Cammell Laird & Co.,

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Limited, to prepare designs in accordance with an outline specification prepared by the engineering staff of the London Electric Railway, and to construct demonstration vehicles under conditions which have been described in the general press as a "competition" the prize for which is to be an order for building the whole or a substantial proportion of the new vehicles required. Special attention is to be given to the reduction of travelling noises, and makers will have before them the benefit of the experience gained from experiments made recently by Professor A. M. Low, of the Low Engineering Company, Limited. It was found that the principal causes which contributed to produce noise on the "Underground" lines were :—(1) The hollow roofs of the cars in which the sound reverberated ; (2) the vibration set up by the windows ; and (3) the contact of the wheels with the metals. When the hollow roofs were filled up with asbestos, the windows fitted with a centre strut to reduce their size, and the wheels encased with a kind of hood, the noise was found to be appreciably reduced.

* * *

In the list of lectures and classes on railway and cognate subjects announced by the London School of Economics and Political Science for the session 1922–23, it is stated that the Brunel Silver Medal is awarded to students in the Railway Department who in not more than four years have obtained three first-class passes in connection with courses approved for the purpose on "The Law of Carriage by Railway," "Railway Statistics," "Operating Railway Economics," "The Railway in Relation to the State," "The New Era in Railway Transportation," "Railway Accounts," "Accounts of Traders and Companies (Parts I and II)." The following list shows the successes gained by the various railway companies since the medal was first instituted, the figure indicated being the number of medals won :- G.W.R., 47 ; G.E.R., 8 ; L. and S.W.R., 8 ; S.E. and C.R., 6 ; G.C.R., 5 ; G.N.R., 4 ; L. and N.W.R., 4 ; Midland Railway, 2 ; Metropolitan District Railway, 1 ; N.E.R., 1 ; Railway Clearing House, 1 ; Foreign Companies, 2. Two Rosebery prizes, one of £25 and one of £10, will be awarded in 1923 for the two best monographs embodying original research in the field of railway transport.

* * *

The new Southampton office of the Canadian Pacific Railway, in charge of Mr. David Drummond, agent, was opened on Monday, September 4. The premises are situated in Canute Road, close to the dock gates and to the railway, and are known as "Canadian Pacific Building."

* * *

For the convenience of business men living in Thanet, a Pullman car, on which breakfast is served, is working on the train leaving Margate at 8.5 a.m., Westgate 8.10 a.m., and Birchington-on-Sea 8.15 a.m., reaching London Bridge at 10.4 a.m. and Cannon Street 10.8 a.m. This Pullman car returns on the 5.10 p.m. train from Holborn Viaduct, reaching Birchington at 7.1 p.m. and Margate at 7.10 p.m.

* * *

A contract has been received by the Westinghouse Brake and Saxby Signal Company, Limited, to provide the signalling material for 120 miles of alternating current signalling, to be installed by the Signal Engineer of the New Zealand Government Railways. This installation is to be on the A P B system, with daylight "colour-light" signals. The same company have been awarded the contract for three-position automatic signalling between Marylebone Station and Wembley Hill, Great Central Railway.

* * *

On Saturday, August 26, by permission of the Governors of the London Orphan School at Watford, the eighth annual Show promoted by the London and North Western Railway (Southern Division) Horticultural Society was held in the grounds of that institution. The two marquees which had been erected accommodated over 1,000 displays of vegetables, fruit and flowers. There was a large attendance, and the weather was favourable. Every provision was made for the entertainment of visitors, while the Watford Silver Prize Band and a concert party supplied musical entertainment. At 2.15 p.m., Major G. N. Ford, O.B.E., District Superintendent, and President of the Society, in declaring the Show open, congratulated the officials and exhibitors on the record number of entries. The prizes were later presented to successful competitors by Miss Edith Bradbury, who was introduced by Major Ford. At the conclusion of the proceedings Mr. C. F. Graseman proposed a vote of thanks to Miss Bradbury, on whose behalf her father, Mr. W. E. Bradbury, M.B.E., Chairman of the Committee, responded. The arrangements were carried out by the Committee of the Society under the chairmanship of Mr. Bradbury, as above mentioned, Mr. S. E. Webb being Vice-Chairman, Mr. W. E. Cheeseman General Secretary, Mr. Webb Hon. Sub-Secretary, Mr. G. C. Robinson,

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Hon. Treasurer, together with many other gentlemen representative of all departments of the staff.

* * *

THE fourteenth annual Show in connection with the North Eastern Division of the London and North Western Railway Horticultural Society was held at Belle Vue Gardens, Manchester, on August 19, when there was a good entry of flowers and vegetables. Mr. T. E. W. Guest, ex-President, in introducing Mr. Ashton Davies, General Superintendent, Northern Division, London and North Western Railway, the new President, expressed the pleasure of all the members of the Society in having the General Superintendent there on that occasion. Mr. Davies expressed his pleasure at being associated with such an old-established Society, and welcomed the opportunity it gave him to be associated with the men in one of the best of hobbies. Mrs. Davies kindly presented the prizes. The London and North Western Manchester (Control) Orchestra provided musical items during the afternoon.

* * *

THE third annual swimming gala of the Stonebridge Park Recreation Club, London and North Western Railway, was held on Saturday, September 2, the lake adjoining the Stonebridge Park power station providing a splendid course, particularly for the distance events. An electric train was drawn up on the track near the lake to serve as dressing rooms. For the Stonebridge events Mr. G. Broughall, Vice-President of the club, acted as referee; Messrs. H. Parkinson and J. E. Brocklehurst, judges; and Mr. R. Jones, starter. London Railways A.A. events were in charge of gentlemen representing various railways, Mr. H. W. Wild, London and North Western Railway, being Hon. Swimming Secretary. General arrangements were in the hands of Mr. F. Dickerson, Hon. General Secretary, and Mr. R. Richardson, Hon. Swimming Secretary, and Mr. S. Waller, Hon. Assistant Secretary of the Stonebridge Park Recreation Club. The open events attracted much attention, particularly the quarter-mile handicap, won by A. C. Eagle (holder), South Eastern and Chatham Railway, for which the 200 yards length of the lake, traversed once in each direction and back to the mark to complete the distance, provided a splendid course, though the team handicaps, twice across the pond for each man, aroused considerable excitement. In the unavoidable absence of Lieut.-Colonel F. A. Cortez-Leigh, Divisional Electrical Engineer and President of the Stonebridge Park Club, Mrs. Cortez-Leigh presented the prizes, supported on the platform by Messrs. G. Broughall and H. Parkinson, the joint donors of the Stonebridge Park Club Championship Cup, and Major Roberts. In reply to a hearty vote of thanks, Mrs. Cortez-Leigh congratulated Messrs. Dickerson and Richardson and the committee on the organisation of the sports, and complimented the swimmers on their excellent performances.

* * *

THE sixth annual Vegetable, Fruit and Garden Show for the London District of the London and South Western Railway was held on Wednesday and Thursday, August 30 and 31, at the Brunswick Institute, Wandsworth Road, Vauxhall. Exhibits were in two sections, the inner covering stations within the ordinary suburban area, and the outer, remaining stations attached to the London District. There was a record number of exhibits, the entries for the inner section numbering 375 and for the outer section 228, total 603, of which more than 80 per cent. were staged. The exhibits were judged by Mr. J. H. Jones, F.R.H.S., a well-known horticulturist. The show was open on Wednesday from 5 p.m. to 9 p.m., and on Thursday from 12.30 p.m., there being a constant stream of interested and critical visitors on both days. On Thursday the General Manager, Sir Herbert Walker, K.C.B., accompanied by Lady Walker, arrived in time to make a detailed inspection of the exhibits. At 7 p.m. the prizes were presented by Lady Walker, and she was supported on the platform by her husband, by members of the organising committee, and by leading members of the staff of the company, including Mr. W. Buckmaster, O.B.E., Assistant to the General Manager, and Chairman of the Garden Show Committee; Mr. R. Duckworth, M.B.E., Chief of Police; Mr. C. Hill, Assistant Storekeeper; and Mr. F. V. Milton, Publicity Superintendent. Mr. Buckmaster proposed a vote of thanks to Lady Walker and to Sir Herbert, the former replying briefly. Sir Herbert followed with a few remarks. The committee responsible for the work in detail was representative of all departments. The secretarial work had been carried out by Mr. Frank Gilbert, of the Publicity Department.

* * *

APPARATUS for the rapid issue of tickets of standard fare values, experimentally installed at Oxford Circus station, London Electric Railway, has already been described in

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these pages, also the installation of another type of apparatus inside a lift to enable the lift attendant to combine the duties of booking clerk, ticket collector and lift attendant where, or at times when, the amount of traffic does not justify the employment of men for each of these duties. Inside one of the lifts at Liverpool Street station, Central London Railway, working between the tube station and Broad Street terminus, North London Railway, "Roll-tic" apparatus has been installed. On being asked for a particular standard-fare ticket, the attendant merely has to operate a handle, and one or more tickets are at once issued, numbered, dated and clipped.

* * *

IN addition to the Pullman restaurant car which has been running since June 1, attached to the 10.10 a.m. express from Glasgow (Buchanan Street) to Inverness, the car running as far as Aviemore and returning attached at that station to the 3.30 p.m. from Inverness, restaurant car facilities have also been provided this month in connection with the 4.30 p.m. sleeping-car express from Inverness to the south. In order to accommodate the return of tourists and sportsmen from the Highlands to the south during September, it has been necessary to run the latter train in two portions, the East Coast section, starting at 4.30 p.m., and the West Coast portion at 4.45 p.m. A Pullman restaurant car is brought by the 12 noon train from Perth to Aviemore and returns attached to the West Coast portion leaving Inverness at 4.45 p.m. In order to provide corresponding facilities for passengers travelling by the East Coast portion, the North British Railway provides a restaurant car which goes north on the 2.10 p.m. train from Edinburgh (Waverley) running as far as Blair Atholl. At this station the car is transferred to the East Coast train from Inverness at 4.30 p.m., as a dining car running to Edinburgh.

* * *

REFERRING to the article entitled "The Original 'Ross' Safety Valve for Locomotives," in the September RAILWAY MAGAZINE Mr. Ahrons points out that none of the Midland Railway locomotives which have, or had, Salter spring balances on the domes had Ramsbottom valves above the firebox. All the latter in brass casings were spring loaded lock-up valves. Ramsbottom valves have only been used for such engines as have round-topped domes without safety valves on them, the first Midland locomotives so fitted being the original Belpaire 4-4-0 series built in 1900.

* * *

SEVERAL readers point out that, although at the time the comment on page 243 of the September RAILWAY MAGAZINE was written, London, Brighton and South Coast Railway 4-4-0 engine No. 46 did not bear the name "Prince of Wales," this has since been restored.

* * *

MR. J. W. ARMSTRONG, of Richmond, Yorks, sends a photograph of an old 0-6-0 saddle-tank engine in a derelict condition. Apparently, it was originally the property of the North Eastern Railway, and belonged to class 964, designed by Mr. Fletcher. In 1918 it was employed on the Catterick military camp railway as No. 104. He asks whether any reader can supply further particulars of this engine, N.E.R. number, dimensions, &c.

* * *

A FURTHER five 0-8-0 superheater goods engines ("G 2" class) will shortly be in service on the London and North Western Railway, Nos. 36, 2381, 2383, 2386 and 2399 (Crewe Nos. 5707–11). Additional engines of the same type are also in course of construction. The "Jubilee" class four-cylinder compound No. 1911 *Centurion* is again running as such, and not as a two-cylinder simple of the "Renown" class, as stated on page 162 of the August RAILWAY MAGAZINE. No. 302 *Greyhound* has been converted from "Precursor" class superheater to "George the Fifth" class. The name-plates "Frobisher," "Talisman," "Ingestre" and "Patience," which were originally intended for Nos. 1747, 1096, 2499 and 2268 of the four-cylinder "Claughton" class, have now been allotted to Nos. 2268, 12, 2420 and 2499 of the same class in the respective order given. "Prince of Wales" class engines Nos. 1584 and 1542 have been named *Scotia* and *Marathon* respectively. No. 758 *Hardman*, a 6 ft. 2-4-0 passenger engine, has been broken up.

* * *

THE RAILWAY POSTAL PHOTOGRAPHIC CLUB, of which particulars appear in our advertising pages, is an association of amateur photographers who are especially interested in railways and everything connected with them. A portfolio is circulated containing photographs of railway subjects taken by the members for the inspection and criticism of the club in general. The subscription is 5s. per annum. Further

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particulars may be obtained on application to the Hon. Secretary, Mr. M. W. Earley, 97, Hamilton Road, Reading, Berks.

* * *

RECENT activities of the Railway Club include visits to the Neasden power station of the Metropolitan Railway and to the following running sheds—Loughedge, South Eastern and Chatham Railway, Devons Road, North London Railway and Hornsey, Great Northern Railway. On Friday, October 13, a paper will be read at headquarters 65, Belgrave Road, S.W. 1, by Mr. Cecil J. Allen, president of the club.

* * *

Now the dark evenings have arrived the model maker is busy overhauling his equipment, and to meet his requirements, Messrs. Vernon Smith & Sons, Limited, 121, &c., High Road, Chiswick, W., have made elaborate preparations. The firm caters for those who build their machines at home and also for those who purchase new or second-hand models. Their arrangements for repair work orders during the coming season are very complete and they have in stock a large quantity of new material for both building and repairing. At the moment they have a fine show of model locomotive engines. Tools are another speciality of the firm, but their activities are very widespread and they likewise deal in cycles, motor-cycles and motor cars. RAILWAY MAGAZINE readers who have anything to buy, sell or exchange are welcomed by Messrs. Vernon Smith.

* * *

"SHUNTO" is the name given to a new railway game now being placed on the market by Messrs. F. H. Ayres, Limited, the well-known sports and games specialists, of 111, Aldersgate Street, London, E.C. 1. It should appeal to all who are interested in railway working, as they can carry out shunting operations on their own account, while it provides a means whereby those engaged in traffic training can study, on a competitive basis, various methods of solving traffic problems. The case is adapted to be opened out so that when the sections are fitted together a shunting yard is laid out in duplicate. One player uses each section, and before starting a series of eight numbered "wagons," a "brake van" and an "engine" are distributed arbitrarily but similarly for each section on three sidings. Usually the players place a wagon, brake-van or engine in turn, the other placing the corresponding one in a similar position on his section, so that the distribution can give no special advantage to either. The tracks are formed by ridges, with pivoted sections to form "points," while the object is, in alternate moves, to get engine, wagons and brake van in correct order on the "main line" in the fewest stages. All moves must include the engine which, with vehicles back or front or on both sides of it, is or are moved by means of pointers along the tracks upon which they ride, points being shifted as desired. As the moves made are all such as would be required in practice with the given lay-out, there is abundant scope for forethought and careful study, the situation being entirely arbitrary to commence with, and very keen competition results. Each move entitles a player to shunt from end to end of a track, or any less distance; and to close up on wagons already standing on the route as set, but not to reverse direction, while obviously the engine must always be used, or it can be run alone. The price, in case finished in green enamel, with two complete trains, and two pointers, is 12s. 6d.; or constructed in solid oak and polished, 21s.

* * *

IN directing special attention to the "Gem" courses of instruction in regard to railway subjects of which particulars appear in our advertising pages, emphasis may be laid upon the increasing importance of a knowledge of railway law and practice and study of railway economics, as well as of courses in general business methods, to the railway clerk or other employee if he is to achieve promotion. The day of the man who can only do his present work, of the routine man, however efficient, is passing, and in the great changes which the next year or so will witness, study and preparation for greater responsibility will be more and more insisted upon. The courses outlined appear to be admirably adapted to assist the railway clerk and others who wish to get on and to qualify for promotion; and our readers, including those outside the railway service, for whom also the National Institute caters, should write to Liverpool as suggested for booklets, pamphlets, and other literature. Successes gained by students of the "Gem" courses have been so numerous, including special prizes and silver medals, that the efficiency of the courses speaks for itself.

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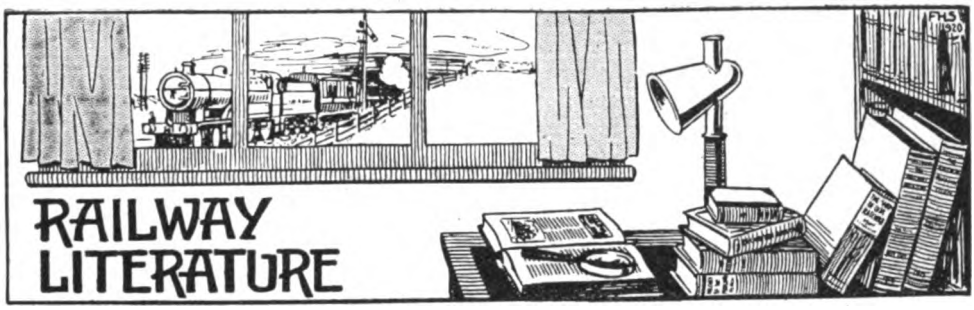

G.E. Joys for Girls and Boys. Words by A. L. G. Illustrations by L. J. K., T. P., and C. J. A. [Printed at the Great Eastern Railway Company's Works, Stratford, E. Price 3d. net.] This book of 48 pages strikes a new note in railway publicity. It appeals to the rising generation and to that section still in the nursery or attending kindergarten. The pictures are in colour and well calculated to fill small children with delight. True, the writer of the verses has not in all cases come down to quite the same unsophisticated level, but it must be admitted that it is no small task to construct really funny rhymes concerning such places as Hunstanton, Mildenhall, Parkeston Quay and Zeebrugge. Real jolly jingles of the "Norwich" and "porridge" order are not nearly so plentiful as the nursery poet who takes a pride in his work would like. Children of larger growth will appreciate the excellent map on the inside back cover of the book. The train on the outside of the front cover is an excellent piece of draughtsmanship, but the passengers depicted thereon are evidently pass-holders, as no fare-payers could possibly look so pleased in these days of high tariffs.

London's Country. [Published by the London "Underground" Railways, Electric Railway House, Broadway, Westminster, S.W. 1. Price 1s. net.]

Described as "Guide No. 1: By Road, Stream and Fieldpath North of the Thames," this volume will be welcomed by a large proportion of our readers. It is well produced, and includes no fewer than 23 maps, one showing the whole of the district covered, with the railway, tramway and motor 'bus routes, and the others giving each district in very complete detail. These maps, in conjunction with the letterpress and a considerable number of half-tone illustrations, render the volume particularly noteworthy, and no one wishing to explore the many country districts within the vicinity of London and accessible by means of "Underground" and associated travel agencies should be without this volume. The entire area north of the Thames and within a radius of some 20 to 30 miles is covered.

The Electrical Handling of Materials. Volume III, "Electric Cranes." By H. H. Broughton. [Benn Brothers Ltd. 8, Bouverie Street, London, E.C.4. Price 50s. net.]

This is the third section of a manual on "The Electrical Handling of Materials," to be completed in four volumes, dealing with the design, construction and application of cranes, conveyors, hoists and elevators, the section now under consideration being devoted to electric cranes. To some extent it constitutes a revision of the author's book on "Electric Cranes and Hoists," but is very largely re-written, a considerable portion of the present contents being entirely new. Chapter I deals with crane arrangements, and is generally of an introductory character, describing the principal types of cranes, and discussing practical considerations as to the adoption of one type or the other, and the special advantages for particular circumstances of each. Chapters II and III are concerned with crane mechanisms, the former considering various arrangements and classes of mechanism, while the latter is concerned more with the design thereof. Chapters IV-XI, inclusive, include descriptions of overhead travelling, gantry, jib, fitting-out, floating, revolving cantilever and steelworks cranes, and of building-slip equipments and charging machines. Chapter XII describes the erection, in so far as crane power is concerned, of the Quebec Bridge. Chapter XIII sets forth the code of safety standards for cranes, and Chapter XIV specifications therefor, while the concluding chapter includes a series of "crane questionnaires." The volume contains a great deal of reference and design data, a large number of line and half-tone illustrations, a series of valuable tables and several folding plates. Examples of every type of crane are described and illustrated, ranging from low and medium power examples to cranes designed to deal with loads of from 150 to 300 tons.

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ANTHRACITE AND THE ANTHRACITE INDUSTRY. By A. Leonard Summers. [Sir Isaac Pitman and Sons Ltd., Parker Street, Kingsway, London, W.C. 2. Price 3s. net.]

This volume, included in Pitman's "Common Commodities and Industries Series," contains a considerable amount of useful information. In early chapters, South Wales coalfield and mining methods receive attention, with particular reference to anthracite, while later chapters deal with the economics and applications of anthracite in domestic service, for industrial purposes, for gas producing and steam raising, &c. It is interestingly written and well illustrated, while there are a number of references to anthracite traffic from the railway point of view.

HOW TO SEND GOODS BY ROAD, RAIL AND SEA. By Geo. B. Lissenden. [London: Sir Isaac Pitman and Sons, Limited, Parker Street, W.C. 2. Price 2s. net.]

In these expensive post-war days, it is essential that the business man should not only send his goods to the best market, but that he should study the science of sending them by the cheapest and most expeditious means. Mr. Lissenden's book is intended to show how and when economies can be effected in the distribution of goods and to demonstrate how carriage costs can be cut down to the lowest possible minimum. The larger portion of the book is devoted to railway traffic and Mr. Lissenden's advice on "bulking," is good both for the trader who forwards and the railway company that conveys the goods. The book, in addition to being useful to the senders of goods, is one that will aid the railwayman himself, particularly the young and aspiring railwayman, who, being employed in some department other than the commercial, desires an insight into the subject.

RAILWAY AMALGAMATIONS UP TO DATE. No. 3, July, 1922. [London: F. C. Mathieson and Sons, 16, Copthall Avenue, E.C. 2. Price 6d.]

As a record of what is taking place in so far as stocks shares in the railways grouped and amalgamated under the Railways Act, 1921, these pamphlets have their uses, while many people will value them as historical records.

Photo.] [*P. W. Moore.*

LONDON, BRIGHTON & SOUTH COAST RAILWAY.

4-4-0 locomotive No. 55. Rebuilt with superheater boiler, Belpaire firebox, top feed, &c.

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THE RAILWAY MAGAZINE.

LONDON, SHEFFIELD AND MANCHESTER RESTAURANT CAR EXPRESS: GREAT CENTRAL RAILWAY.

3.20 p.m. Down Express leaving Marylebone Station.

4-6-0 Locomotive No. 426, "CITY OF CHESTER."

(From a Photograph by A. L. P. Reavil.)

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FUSAN-ANTUNG EXPRESS AT KEIJO.

Japanese Railways in Korea and China.

THE TRANSFORMATION OF THE "HERMIT KINGDOM" AND THE DEVELOPMENT OF SOUTH MANCHURIA.

By R. W. A. SALTER.

PRIOR to his return to England a few months ago, the writer had repeated occasion to travel to and fro over the railways in Korea and South Manchuria. The characteristic features of the system in the former country were described by him in an article entitled "The Chosen Railways," in the RAILWAY MAGAZINE for November, 1917; but a few additional observations may be acceptable. It is well to observe that since the former article was written, the management of the Korean railways has been transferred from the Railway Bureau of the Government General to the South Manchuria Railway Company, thus placing all the Japanese railways on the Asiatic mainland (with the exception of the Shantung Railway, seized from the Germans in 1914) under unified control.

Korea, or, to use the Japanese official appellation, Chosen, is, of all civilised countries, probably the least known and least visited by Europeans. Indeed, up till quite late in the last century, so few white people had entered the interior that it was then, and is now, popularly called the "Hermit Kingdom." Only since the incorporation of Korea into the Japanese Empire in 1905 has a railway system been developed to open up trade and commerce and to enable use to be made of the abundant natural resources and mineral wealth in the form of gold, coal, iron, silver, copper and lead. Korea, whose physical characteristics have been likened to "a sea suddenly congealed during the progress of a gale of wind," is a peninsula projecting southward from the north-eastern coast of Asia, devoid of good harbours on its eastern coast (with the exception of Genzan), but extremely well favoured in that respect on its southern and western coasts. A mountain range runs from north to south, forming the backbone of the peninsula. The railways are mostly

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on the western side of this mountain range, the main line extending from Fusan, the southernmost point, to Antung, on the northern frontier, and keeping parallel, almost from end to end, with the Peking Road, the only highway—if it may be dignified by such a name—in the country.

Fusan, therefore, the landing place of most travellers making a journey from Japan into Korea, is a point at which we may well begin by describing the railways. This splendid natural harbour, important, growing, and now celebrated as the Far Eastern terminus of the great trans-continental railway linking Europe with

INTERIOR OF THIRD CLASS COACH.

Most of the passengers are Koreans of the lower order, in national dress.

Japan, is connected twice daily with Japan by the magnificently equipped 3,000-ton steamers of the Imperial Government Railways, which depart from and arrive at Shimonoseki in connection with the express trains from and to Tokyo. Two stone piers extend far out into the harbour: the steamer ties up at one of these; and the Korean boat train is already there waiting to receive passengers. In point of convenience, those who are familiar with the Dover and Calais mail service need look no further for a comparison.

If the crossing of the Chosen Channel be made in winter, the traveller will find that he has deserted a mild semi-tropical climate for one which may be likened to that of south-east Canada; but, notwithstanding biting winds and a low temperature, the days are usually dry and sunny. The approach from the sea is picturesquely displayed as the vessel steams slowly into the mountain-girt harbour. The town itself is scarcely visible, so snugly is it packed among the high hills. Its streets, though narrow, are clean, well-paved and served by a narrow-gauge electric tramway having cars that the Japanese residents facetiously call "birdcages." A few minutes' walk along the pier and through the town brings one to the station devoted to ordinary trains, adjoining which is a hotel maintained by the railway.

The main line of the Korean railways begins, then, at Fusan. The construction of this line was undertaken in 1901 by a private company and opened to traffic in the first month of 1905, constituting, then as now, the greatest boon ever bestowed upon the inhabitants of the "Hermit Kingdom." It is of the standard gauge, the rails, spiked direct to the sleepers, weighing 76 lb. per yard. Throughout its entire length the line traverses level plains or valleys between the mountains, so that places with sharp gradients are comparatively rare, between Fusan and Keijo

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(Seoul) there being no gradient of more than 1 in 50 or 60 (as a rule only about 1 in 80 or 100), and from there to the frontier there is not a single gradient of more than 1 in 100. Tunnels also are few in number, the longest being that at Shoken, which has a length of 3,948 ft. There are ten others each more than 1,000 ft. long. Bridges, on the other hand, are numerous, the longest, which crosses the Yalu River, being 3,097 ft; whilst there are two over 2,000 ft. long and six over 1,000 ft.

Keijo, or Seoul, situated at a distance of 280 miles from Fusan and accessible from that town by express train in about 8 hours, after halts at fourteen of the 42 intermediate stations, is the ancient Korean capital, the present seat of the Japanese Government General and the headquarters of the South Manchuria Railway in Korea. The city has a population of approximately 300,000. Thanks to Japanese administration, its festering alleys, which lacked even the redeeming quality of picturesqueness, are fast being replaced by broad avenues and streets paved in western style, and by modern brick buildings, of which the splendid hotel controlled by the railway is probably the best example. The facilities offered by the ramshackle station at Nandaimon are totally inadequate, but the writer is informed that plans have been approved for a new station, on which work may have been started by the time this article appears in print. About a mile north of the station lie the locomotive, carriage and wagon works, of which the railway company's officials are justly proud. Not only are repairs executed here, but the construction of passenger and goods rolling-stock and the rebuilding of engines is also carried out.

On the Korean lines 10-wheel superheater locomotives, each weighing 112 tons, are the newest in use; the remainder comprising four types of tender engine and three types of tank engine. The majority of goods wagons are mounted on 4-wheel bogies and have a capacity of from 22 to 26 tons; a few are 6-wheelers of 50 tons capacity, while several are 10-ton 4-wheel trucks for use in the workshops. Most of the goods rolling-stock is fitted with air brakes or air pipes.

INTERIOR OF DINING CAR.

American influence displays itself in the type of passenger coaches. These are fitted with 4-wheel bogies, have transverse seats, centre passages, steam heaters, air brakes, vestibules and electric lighting and fans. There are three classes of accommodation. Express trains carry third-class passengers in corridor coaches with wooden seats, the majority of people travelling by this class being Koreans, with

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a fair sprinkling of Japanese soldiers and their families. For the first and second-class passengers, consisting almost exclusively of Japanese and Europeans, the latter a minority, there are a dining car and one or more sleeping cars of the standard American type with berths that pack up in the ceiling when not in use. Indifferent European meals are served in the dining car, and usually a more appetising repast can be made from a bowl of Japanese *domburi* with tea and pickles—an Oriental dish not too distasteful to the European palate.

There is not much to distinguish the scenery north of Keijo from that in the south. The general aspect of the country is bare and monotonous, and, were it not for the majesty which the very baldness of the mountains suggests, it would soon become wearisome to the mind and eye. The pernicious effects of the wholesale deforestation of the mountains, the result of Korean ignorance and lack of foresight, are obvious to the traveller. Where the surface is flat and irrigated by streams flowing down the sides of the mountains, the soya bean, the staple article of the country, which is used for food and yields luminant oil, is cultivated all along the line. Much in evidence, too, are the swinish mud villages of the Koreans. The Koreans themselves are a sturdy non-maritime race, of good physique and not unhandsome Mongoloid features, but possess to a sordid degree the vices of dirtiness, laziness, duplicity, cunning and general untrustworthiness. Both men and women dress in white robes, to the cleanliness of which they are more attentive than they are to their own persons; and the former wear a black gauze hat, something like the European top hat, but with a crown much smaller and a brim correspondingly wider. At every wayside station hundreds of these people gather, some standing like penguins, others sitting in fatuous vacuity, apparently with no other motive—if they are capable of having motives—than to see the train go by.

INTERIOR OF OBSERVATION CAR, KOREAN LINES.

In the comfortable, well-heated trains, the journey of 8½ hours from Keijo to Antung (310 miles) is quickly over, and the traveller soon finds himself looking down from the carriage window on to the broad expanse of the Yalu River, which is crossed just before entering Antung, the first station in Chinese territory. Antung, which is really the Japanese settlement, and Shahochen, the Chinese quarter, have a combined population of 28,000, and possess much the appearance of a Canadian prairie town. The train halts here for some little time for Chinese Customs and passport examination. Locomotives are changed, and the train proceeds over the

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metals of the South Manchuria Railway proper.

It is worthy of remark that the railway from here as far as Mukden is, as regards its inception, of an entirely different nature from the rest of the South Manchuria Railway Company's system, for it was originally a light railway of 2 ft. 6 in. gauge, constructed for military purposes by the Japanese army. After an agreement had been concluded between the Japanese and Chinese governments, the line was transferred by the Field Railway Department to the South Manchuria Railway. Owing partly to topographical difficulties and partly to differences between the two governments, the reconstruction work was delayed until August, 1909. In order to carry the light gauge traffic even while reconstruction work was in progress, the standard gauge rails were laid outside the narrow gauge, and the whole work, inclusive of 24 tunnels, 205 bridges and 213 culverts, was completed in two years and two months. The conversion has shortened the journey by no less than 40 hours.

The traveller is now in Manchuria, of which, like Korea, very little was known to the outside world until a quarter of a century ago. The Sino-Japanese war in 1894–5 may be said to have marked the advent of Manchuria in modern history, and the country was again brought into prominence during the Russo-Japanese war of 1904–5. By the Treaty of Portsmouth (U.S.A.), Russia ceded to Japan, with the consent of China, not only the balance of the lease of the occupied teritory in the Liaotung Peninsula, but also a southern portion of her Manchuria Railway, namely, that from Changchun to Dairen, and all the appurtenances thereof, including the Fushun coalfields. In the same year an agreement was concluded with China whereby Japan should lease and operate for a certain number of years the railway between Mukden and Antung, which is described in the preceding paragraph. This was made a branch of the main line and renamed the South Manchuria Railway; and in November, 1906, the present South Manchuria Railway Company was established under Imperial decree to operate the lines and develop and manage the railway area. By a treaty concluded in May, 1915, the lease of the Kwantung Territory and of the South Manchuria Railway was extended, in the case of the former up to 1997, and of the latter up to 2002.

After leaving Antung station almost everything assumes a different aspect—the nature of the country, of course, in a lesser degree, though it is noticeably more fertile and better cultivated. The tall, gaunt figures of the Chinese, in their close-fitting, padded, dark blue suits and black skull caps, look almost satanic after the white-robed Koreans. The mean little Mongolian houses are palaces compared to the mud hovels of Korea. Every station has its guard of Japanese military police, and it is surprising to observe how these energetic little people dominate their big neighbours, from whom, hundreds of years ago, they gained their civilisation. Mukden, reached at the 171st mile, is one of the most important railway junctions in China, and its two stations, Fengtien (South Manchuria Railway) and Shen-Yang (Chinese Government Railway) are connected by rail so that the important trains of the latter railway can use the station of the former. A walled city, and one of the oldest in Manchuria, known until a few years ago as the "Forbidden City," Mukden has a population of about 172,000, including 3,000 Japanese. The New Town, the Japanese settlement, is in the close vicinity of Fengtien station.

From Mukden the writer made a side journey to Fushun, to visit the coalfields, which were formerly Russian and are now managed and worked by the South Manchuria railway, under orders from the Imperial Government. At the time of the acquisition of the collieries by the railway, the mining arrangements were of a temporary nature, with an aggregate daily output of only 360 tons. The Fushun field, now worked partly on the open-cut system and partly by shafts and pits, has a daily output of nearly 12,000 tons of semi-bituminous coal. There is not space here to enter into a lengthy description of the collieries and their equipment, however interesting; but from the railway reader's point of view it is worth remarking that the Electric Railway Department controls 24 50-ton and four 25-ton electric locomotives, and four motor cars, with five tenders. The 50-ton locomotives are designed for D.C. 12,000-volt single trolley

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system, equipped with four 120-h.p. motors and capable of hauling a trainload of 600 tons over one tangent level track. Three of them are A.E.G. machines, thirteen G.E., while four are of Japanese manufacture. Seven locomotives are now serving on the main transportation line, 38 miles in length; six on the sand transportation line, 42 miles in length; three for train formation at Fushun station yards, one at the locomotive shed, and the remainder are used for auxiliary purposes. Overhead construction is the five-point catenary suspension, with single iron-lattice poles, spaced at 150 ft. The collieries have two

South Manchuria Railway, and the terminus of the branch of the Chinese Eastern Railway from Harbin, which connects it with the trans-Siberian railway.

Southward from Mukden the South Manchuria Railway, with its splendid modern American equipment, conveys the traveller in 9½ hours over 246 miles of rich, undulating plains, drained by many a famous river, to Dairen. During the Russo-Japanese war, the region traversed by the railway formed a fighting zone stubbornly contested by the opposing armies, and from both sides of the train the traveller can see the tell-tale remains

"PEACH BLOSSOMS" EXCURSION TRAIN.

A special train is also run from Keijo to Heijo (160 miles) for those who wish "to view the autumn leaves."

electric power plants and another under construction. As a matter of historical interest, it may be recorded that the mine was worked as early as the twelfth century, when the region was under the rule of the Tartar dynasty and maintained in close communication with the people of Korea.

Northward from Mukden the main line of the South Manchuria Railway extends as far as Changchun, a distance of 189 miles and a journey of 5½ hours, taking the traveller past several important places, among which special mention may be made of Kungchuling, a spot chosen by the railway for the establishment of a model farm. Changchun is the northern terminus of the

of hundreds of trenches zig-zagging across the plains and pointing to the hills. The last time the writer travelled on this line he broke journey at Tangkangtzu, which is about half-way between Mukden and Dairen. The well-provided Japanese hotel here, built on the site of a hot spring, much patronised during the summer by week-end visitors from Dairen, is a pleasant place to stop at, besides being convenient for visiting Anshan, one station north, where the railway company has established an extensive iron and steel works, around which a large town is springing up.

Dairen, the southern terminus and headquarters of the South Manchuria Railway,

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is situated at the end of the Liaotung Peninsula, in the Kwantung leased territory, and, with Manchuria and Mongolia as its resourceful hinterland for exploitation, has become one of the most prosperous ports of the Far East. In 1857 it consisted merely of a few scattered fishing hamlets, but, now able to boast a population of over 100,000, its rise to a city of importance has been almost phenomenal. The chief feature of the city is its well-sheltered port, which is partly natural, and is the only port in Manchuria free from ice throughout the year. The maintenance of the harbour is looked after by the South Manchuria Railway.

A branch line, 37 miles in length, connects Dairen with Port Arthur (Ryojun) the home of the civil administration and military offices of the Kwantung Government. The journey occupies an hour and a half, but soon an electric railway will be built, reducing that time by some 40 min. or so. The town of Port Arthur, and the surrounding country, was the scene of the fiercest fighting in the Russo-Japanese war.

In 1908 the South Manchuria Railway Company began the erection of a modernly equipped workshop on an extensive scale at Shahoku, near Dairen. These works were completed in 1911 and are now among the largest in the Orient, having an area of about 12,000 square yards and the capacity to execute repairs contemporaneously on 27 locomotives, 36 passenger cars, 130 goods wagons, besides constructing and repairing other railway materials, mining machinery, &c. Of the rolling-stock now in use on the South Manchuria lines, 56 passenger coaches, 808 goods wagons, and 20 goods brakes were constructed at these works, in addition to which orders were fulfilled for the Chinese Government Railways. The other activities of the company include electricity and gas supply, and furthermore, in compliance with instructions of the Imperial Government, town planning, building and administration, as well as the organisation of education and sanitation within the entire railway zone. To provide a basis for the administration of these various enterprises the company has established several institutions for scientific research, which have fully justified themselves by good results.

SECOND CLASS SLEEPING CAR.

As arranged for day use. Berths are lowered from the ceiling at night.

In summing up, it is found that the total length of the railway lines in operation by the South Manchuria Railway is roughly 1,684 miles, or a little less than the total first track mileage worked by the Midland

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Railway of England; but the activities of the company are by no means reflected by the railway alone. As Mr. S. Hayakawa, a Japanese financier and president of the South Manchuria Railway Company, stated to the writer for insertion in the RAILWAY MAGAZINE, the aims and functions of the South Manchuria Railway are based essentially upon a mission of enlightenment, the Japanese Government having accepted the principle—one which proved so important in the development of the British Empire—that the essence of colonisation lies in the advancement of the cultural and material level of the countries traversed by its railways. And it is not surprising, therefore, that from the first president of the company down to the present one the management of the South Manchuria Railway has invariably been confided to men of rare capacity, executive ability and judgment.

Railway Returns for 1921.

RETURNS of the capital, traffic, receipts and working expenditure, &c., of the railway companies of the United Kingdom for the year 1921, have now been published. It will be remembered that a preliminary statement of some of the more important particulars relating to standard gauge railways in Great Britain was issued in March, 1922. It appears that the total capital issued (including nominal additions) by railway companies in the United Kingdom was, at the end of 1921, £1,328,000,000, an increase of only £500,000 during the year. There was an actual loss on railway working in the United Kingdom during 1921 of £9,388,000, railway expenditure having been £236,721,000, against receipts of £227,333,000. Losses on working other businesses brought the total deficit on working up to £10,334,000, even after allowing for the profit of £466,000 on hotels, &c. Miscellaneous receipts of £4,442,000 reduced this deficit to £5,892,000. Adding Government compensation of £53,211,000 and £4,604,000 taken from compensation since decontrol, gave a total net income of £51,923,000, compared with £53,012,000 for 1920.

Total mileage is now 23,723½ miles, second track 13,416 miles, and total track mileage, including sidings, 56,164½. Steam locomotives number 25,180, and electric 84, while there were 64 steam locomotives on hire to railways. Rolling-stock statistics were: rail motor cars, 126; electric motor cars, 1,420; coaching vehicles for steam trains, 50,586; electric trailers, &c., 1,909; Pullman cars, 128; merchandise and mineral vehicles, 759,722; wagons on hire to railways, 6,278; railway service vehicles, 52,245; passenger road motor vehicles, 155; parcels and goods road motor vehicles, 1,690; steamboats (over 250 tons net), 100; steamboats (under 250 tons net), 98; length of canals, 953 miles. Train mileage—steam tender and tank engines, 451,678,577; electric traction, 31,528,895; and rail motor cars, 1,125,127; total, 484,332,599. Numbers of passengers—first-class, 25,287,584; second-class, 5,985,610; third-class, 911,147,813; workmen, 309,635,379; numbers of season tickets (annual), 945,683. Freight tonnage—general merchandise, 53,513,993; coal, coke and patent fuel, 129,200,736; other minerals, 39,414,584; total, 222,129,313. Head of live stock, 20,048,295.

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Locomotive and Train Working in the latter part of the 19th Century.

TAFF VALE RAILWAY.—[No. II.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

AS the Taff Vale is essentially a mineral railway, the engines for and the working of the coal trains cannot very well be omitted when describing it. Until the end of 1885, when the first of the modern 0–6–2 tank engines, which are now almost universal on the line, made their appearance, nearly all the mineral trains were worked by tender engines. Considering that the runs are so short, the late advent of the tank engine is somewhat surprising, since the neighbouring coal lines—the Rhymney, Brecon and Merthyr, and the Monmouthshire Valleys sections of the Great Western—had been worked by tank engines for many years before the Taff Vale took to them. Naturally, there was a large amount of tender-first mileage performed by the Taff Vale engines, as it was obviously out of the question to turn the engines at the end of each up or down journey. In this respect tank engines can show a great deal in their favour, but, on the other hand, tender engines in those days had a certain advantage on the Taff Vale, which to some extent compensated for the disadvantage mentioned.

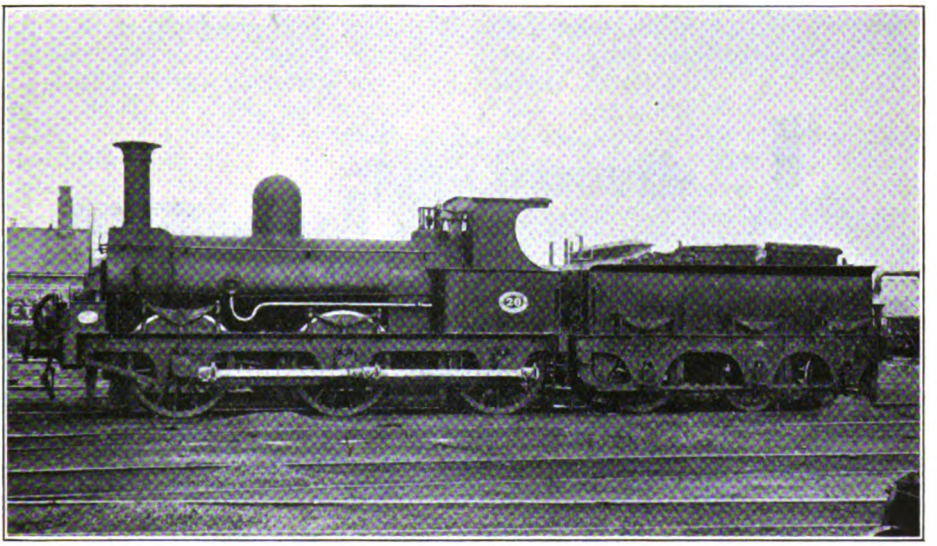

Photo.] [*Loco. Publishing Co., Ltd.*

0-6-0 MINERAL ENGINE, No. 26.

Designed by Mr. J. Tomlinson, Taff Vale Railway Co., Cardiff, 1867. Wheels, 4 ft. 8 in. diameter. Cylinders, 16 in. by 24 in.

This advantage lay in the amount of brake power available. If the 0–6–0 engine be supposed to have a weight of 37 tons, plus a mean weight of 30 tons for the tender, and if we assume that the steam brakes and brake gear are arranged for a maximum brake force between the blocks and the wheels of 65 per cent. of the engine weight, and 85 per cent. of

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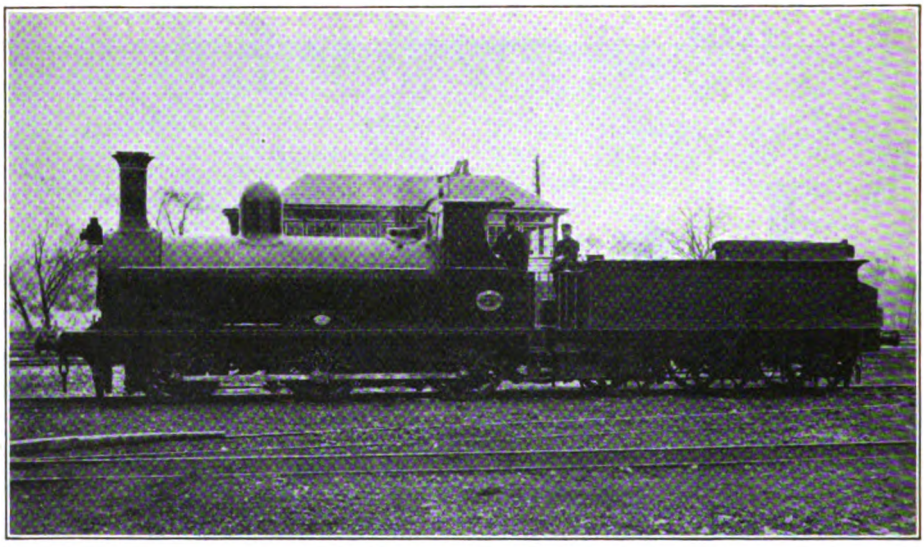
the weight on the tender, the total brake force available is 53,900 lb. for the engine and 57,100 lb. for the tender; total, 111,000 lb. Taking the case of a 0–6–2 tank engine having a total average weight of 50 tons, it must be first of all borne in mind that only the six-coupled wheels are braked, since brake blocks for the radial wheels are inadmissible. Therefore, if the mean weight on the coupled wheels is 40 tons, the total brake force, at a maximum of 65 per cent. of this amount, is about 58,200 lb. In other words, the tender engine has nearly double the amount of brake power available.

add that it by no means applied to all trains, for many of those worked by tender engines had brake vans. And I cannot remember seeing any of the trains bound for Penarth, over the loop which crosses the Great Western main line at Ely, without brake vans. The coal trains consisted almost entirely of private owners' wagons.

The tender engines which worked the greater number of the coal trains were of the standard British 0–6–0 type with inside frames, and had 4 ft. 6 in. wheels and 17½ in. by 26 in. cylinders. They carried 140 lb. pressure and had a total heating surface



0-6-0 TENDER ENGINE, No. 104.

Built by Kitson & Co., Ltd., Leeds. Wheels, 4 ft. 6½ in. Cylinders, 17½ in. by 26 in.

The question may be asked: How did this specially apply to the Taff Vale Railway as it was then worked? During the period 1887 to 1890, when I saw a good deal of this line, I noticed that a large number of coal trains used to come down past Crockherbtown into Cardiff without rear brake vans. Frequently a number of wagon brakes were pinned down, but in all such cases tender and not tank engines were employed. Whenever a tank engine was used there was a brake van at the rear of the train.

It was a method of working to which I was unaccustomed, and the tailless coal train looked somewhat of a curious phenomenon. At the same time, I should

of 1,015¾ sq. ft. The six-wheeled tenders had a capacity of 1,875 gallons. There were 85 of the class, of which 73 were built by Messrs. Kitson, and Co., of Leeds, and the remainder at the Taff Vale works at Cardiff. All of them came out during the period 1874 to 1889, and were practically identical with the Lancashire and Yorkshire standard goods engines of the same period, Messrs. Kitson having been largely responsible for the details of both designs. But the Taff Vale engines were fitted with adjustable cottered brasses for the coupling rods, instead of the more usual circular bushes. Since the last two of these engines came out in 1889 no tender engines have been built for the Taff Vale Railway.

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There was, in addition, an older class of 0-6-0 tender engines, with double frames, 4 ft. 8 in. wheels and 16 in. by 24 in. cylinders. These had been built during the period 1857 to 1869, mostly at Cardiff works, and some by the firms of Hawthorn, Kitson, and Slaughter. These had much in common with the old Midland goods engines designed by Mr. M. Kirtley, and the same pattern of double folding smoke-box doors was used. Mr. Joseph Tomlinson, the predecessor of Mr. T. Hurry Riches, as chief of the Taff Vale locomotive department, had been a Midland man under Mr. Kirtley, and was responsible for the design of many of the above engines.

Four 0-6-0 engines, Nos. 86 to 89, by Sharp, Stewart Company, 1873, with 4 ft. 6 in. wheels and 16 in. by 24 in. cylinders, were of that firm's standard type, as supplied to the Furness and Cambrian railways. These engines retained the old red-brown colour, like the passenger engines, but all the goods engines of the other two classes were painted black. The red-brown colour also disappeared from the passenger engines after 1890.

There were also about 16 0-6-0 saddle and side tank engines mostly with double frames, of three different classes. Four of these had originally been the well-known Metropolitan engines, with 20 in. by 24 in. cylinders, which in 1868, and for a few years subsequently, worked on the St. John's Wood line. They were purchased by the Taff Vale Railway in 1873–4, and the cylinders afterwards reduced to 18 in. diameter. Most of the tank engines worked on the upper reaches of the line, and on the branches, and only occasionally came down to Cardiff with main line coal trains. Several were used as shunting engines.

Three additional 0-6-0 side tank engines, Nos. 141 to 143, built by Kitson and Co. in 1884, were employed on the 1 in 13 gradient from Pwllyrhebog up the Clydach Vale. These were of special design in that the boiler was of the coned or "wagon-top" type, with a fire-box having a sloping top. This arrangement was necessary to keep the fire-box crown covered with water when the engines worked bunker-first up the bank. The domes, with spring balance safety valves, were placed over the fire-box. In addition to steam brakes the engines were fitted with sledge brakes placed between the driving and trailing wheels; these could be lowered and applied to the rails, in a similar manner to the brakes generally used on tramcars in towns with severe gradients.

The cylinders of these three engines were 17½ in. by 26 in., and the coupled wheels had the large diameter of 5 ft. 3 in. to allow the axles to clear the rope which passed underneath them. The system of using the wire balance ropes in conjunction with these engines has already been mentioned. The engines push the wagons up the bank, and the rope passes underneath the wagons, and is attached to a special draw-bar beneath the footplate. They are still in service, but the older 0-6-0 tank engines mentioned previously have mostly disappeared.

In 1885 the first of the 0-6-2 tank engines, Nos. 144 to 153, were placed in service, and since that date this type of engine has gradually become standard on the line. The new engines had cylinders 17½ in. by 26 in., 4 ft. 6½ in. coupled wheels, and motion interchangeable with those of the 0-6-0 tender goods engines previously described. The boilers had a heating surface of 922 sq. ft. and carried 140 lb. pressure. The tank capacity was 1,400 gallons, and the weight in working order 52¼ tons.

For a time the tank engines appeared to be used principally on the heavier passenger trains, especially on the Cardiff (Queen Street) and Penarth service, which at one time was worked entirely by them. They do not seem to have superseded the 0-6-0 tender engines on the main line coal trains for some time, and ten more of the latter class were built subsequently during 1885–89. But as the number of tank engines, and the use of tail brake vans increased, they gradually replaced the tender engines. In the later tank engines of this type the power was increased by making the boiler pressure 150 and 160 lb. per square inch. The heating surface was increased to 1,002½ sq. ft. and the grates were made of larger area.

The six-coupled tank engines having proved very handy for passenger trains, Mr. Riches decided to build a similar 0-6-2 class with larger 5 ft. 3 in. wheels, specially adapted for this purpose, and

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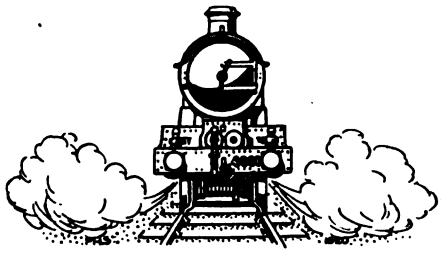
in 1895 eight engines, Nos. 191 to 194, 23, 72, 76 and 77, were built by the Vulcan Foundry, followed by seven more in 1896, Nos. 30, 40, 79 and 195 to 198. These engines, which were the last passenger engines built for many years for the railway, weighed 64 tons in working order. The wheelbase of the coupled wheels is 14 ft. 5 in., being 1 ft. longer than that of the mineral tank engines, and the boiler is pressed at 160 lb. per square inch. They worked the greater part of the passenger trains until recently.

The only other locomotives to be placed in service before the end of the nineteenth century were six heavy 0-6-0 saddle-tank engines, which were constructed by Kitson and Co. in 1899. These have 17½ in. by 26 in. cylinders, 4 ft. 6½ in. wheels, and 150 lb. pressure, and replaced the old Metropolitan 0-6-0 tank engines on some of the branches. They remain the only engines of their class on the line.

In the above notes on the Taff Vale Railway I have omitted mention of Penarth Docks, which are leased to and controlled by the company. The Chief Mechanical Engineer, in addition to his locomotive and rolling-stock duties, was also responsible for the coal tips and a very extensive hydraulic equipment in connection with these docks. It is not my intention to deal with these, and those readers who are interested will find some account of the docks in the RAILWAY MAGAZINE of September, 1906, and the coal tips and hydraulic machinery were described in a paper read by Mr. T. Hurry Riches and Mr. T. E. Heywood before the Institution of Mechanical Engineers at Cardiff in July, 1906.

One question of considerable interest was raised during the discussion of the above-mentioned paper, viz., the use of high-capacity bogie coal wagons. It was remarked that a four-wheeled wagon having a coal capacity of 20 tons could be more easily handled on the colliery sidings, but that the adoption of the larger bogie wagon would cause much inconvenience to many of the collieries. Mr. Riches pointed out that South Wales coal was extremely friable, and had to be handled with extreme care. To tip South Wales coal, even when fresh from the pits, necessitated that the wagons had to be canted to an angle of 45 deg., and if the wagon was lengthened it necessarily followed that the coal would receive a great deal more tumbling than it got with the 20-ton short wagon. Although the question had often been raised, the above was one reason why the long bogie wagon had not been adopted in South Wales.

A considerable amount of further detailed information on the Taff Vale Railway stations and coal sidings appeared in the RAILWAY MAGAZINE of March, 1907, in an article entitled "Cardiff: The City, its Railways and Commerce."



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Fruit Traffic on the Midland & Great Northern Joint Railway.

WITHIN less than 30 years the cultivation of fruit has extended so greatly in the Wisbech district that it has become almost, if not quite, the largest in England. Some 30,000 acres are now devoted to fruit growing, covering large areas in the counties of Cambridge (including the Isle of Ely), Lincoln and Norfolk. About one-half is orchard, the remainder being devoted to the cultivation of strawberries, raspberries, currants and gooseberries.

A STATION YARD HALF-AN-HOUR BEFORE CLOSING TIME.

All classes of fruit demand, in their respective seasons, special measures on the part of the railway companies concerned, but the strawberry traffic is, for many reasons, one of the most difficult to conduct owing to the large volume of the traffic confined within a short period and the perishable nature of the fruit requiring special care in transit. The Wisbech season for the present year followed the Kent and Hampshire soft fruit seasons, and attained considerable dimensions, though the traffic was not so heavy as the record crop of 1921.

The task of transporting the fruit to the market, generally to the industrial centres of the Midlands and Northern Counties, also to Scotland, was shared between the Midland & Great Northern Joint and Great Eastern Railways. The former serves the larger portion of the district, 19 stations being concerned and the needs of some 2,000 growers being met. During equal to half of the season the daily average number of loaded trucks required on this line was 350, the highest total on any one day being 460. During the remainder of the season the demand was also heavy, though not to the same extent.

On the Midland & Great Northern Joint Railway fruit is conveyed exclusively by special trains during the season, these trains being despatched to the junctions in quick succession, and although

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single track only is available for part of the journey the work was so well performed as to earn the universal commendation of the growers.

The container most favoured for strawberry and other soft fruit traffic is the 'chip" basket, in the use of which Wisbech was the pioneer, this convenient and popular container having been used throughout the district from the start. This type of container is now adopted in other districts also, though usually in a smaller size. In the Wisbech district are placed in tiers, the baskets fitting together so that they ride firmly without damage to their contents. About five tiers are usual, but eight and even ten have travelled without harmful effects, while road vehicles carrying supplies to or from the rail sometimes build up as many as 12 tiers. Experiments have been made with railway vans having shelves to avoid placing one "chip" on another, but the practice has been discarded, not only in the Wisbech district, but also in other fruit-growing areas.

A MIXED LOAD OF "CHIPS" AND TRAYS.

the 4-lb. "chip" is in general use. As only two "chips" can be handled at a time when transferring from road vehicle to railway wagon, or *vice versa*, the use of 4-lb. "chips" reduces handling by over one-fourth as compared with the 3-lb. "chip." This is an important advantage in favour of the larger type of container, as labour time is reduced, to the advantage of growers in getting later acceptance times at stations, while labour costs to the railway are also kept down. Both producer and consumer are further benefited by reason of railway rates being regulated by cost of transport.

In loading into railway vans the "chips" Judging by experience of about 30 years in the Wisbech district, "chips" arranged in tiers within the railway wagons will be the predominant method of loading. During the strawberry season now closed, nearly 3,000,000 "chips" were conveyed by the Midland & Great Northern Joint Railway, while other and larger containers numbered nearly half a million.

Two photographs, kindly supplied by Mr. W. Marriott, M.Inst.C.E., Engineer and Traffic Manager to the Midland & Great Northern Railways Joint Committee, are reproduced, showing, respectively, a station yard about half an hour before closing time and a mixed load of "chips"

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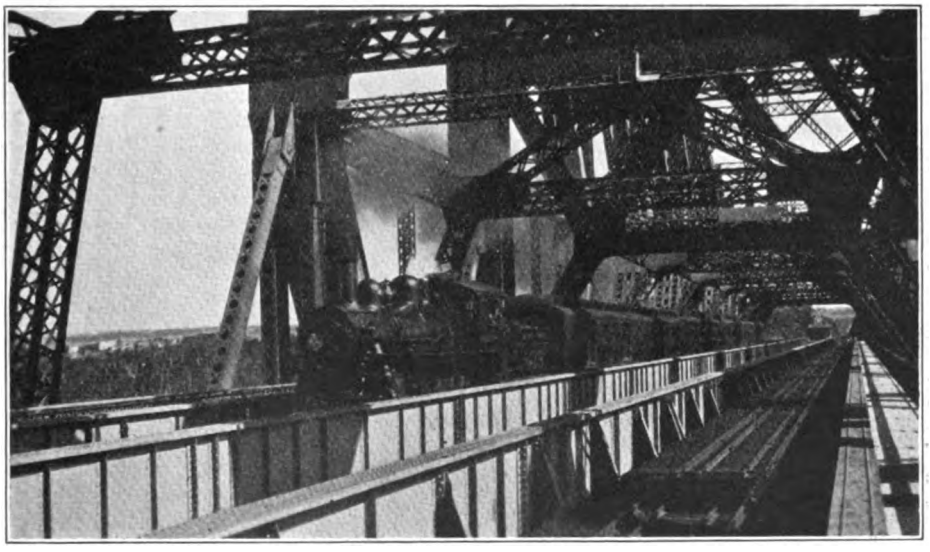
and trays. The scene in the station yard brings out some of the difficulties of transport, a comparatively small station having to manipulate in a short period of time a large number of road vehicles, ranging from perambulators to motor lorries. To avoid congestion in the yard is no easy task, as the vehicles have to move from one railway wagon to another to discharge their loads, it being by no means uncommon for one grower to consign to as many as 20 different destinations.

The output of the orchards is heavier than in the case of soft fruit, and, as the great majority of the trees are not yet fully grown, the crop is naturally increasing steadily. This year plums constitute an exceptionally heavy crop, while apples will reach a fair average. The transport of hard fruits is much easier than in the case of soft fruits, despatch being spread over as many months as strawberries take weeks. Plums have to be marketed more quickly than apples. Up-to-date business methods have been largely adopted in the district, including the use of cold-storage plants, by which the flow of hard fruits to the markets can be regulated in the interests of all parties concerned. A scheme has been adopted by the growers, in conjunction with their local association, by which an advertising campaign will be carried out with the object of inducing people to eat more fruit, thus improving the national diet and encouraging an important home industry. In the results of this scheme transport also will share.

ON THE QUEBEC BRIDGE.



WE are indebted to Mr. F. R. Porter, Pay-Lieut., R.N., for a series of photographs showing the famous Quebec Bridge across the St. Lawrence. One of these is reproduced above, giving an unusual view of the bridge. The train is a Grand Trunk Railway express drawn by 4-6-0 engine No. 419.

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G.N.R. 4-6-2 LOCOMOTIVE, No. 1471, ON 610-TON TEST TRAIN.

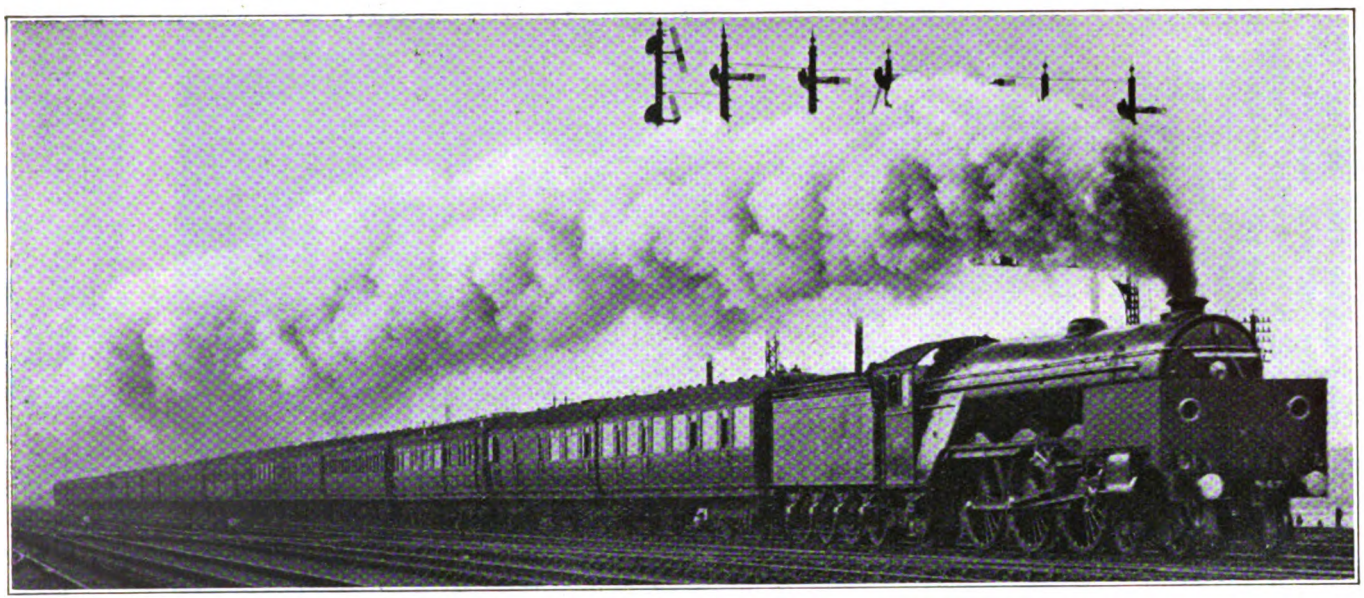

Photo.] [*H. Gordon Tidey.*

THIS locomotive recently worked a test train consisting of 20 corridor vehicles weighing 610 tons between King's Cross and Grantham, a distance of 105·5 miles, in 2 hours 2 min., an average speed of close upon 52 miles an hour. The length of the train over buffers, including engine and tender, was 1,221 ft. $4\frac{7}{8}$ in., and the total moving load 759 tons. The train as made up comprised 90 pairs of wheels, the two vehicles next the engine being of Mr. Gresley's articulated type, followed by six 12-wheeled coaches, the remaining 12 vehicles each having eight wheels. The test run took place on Sunday, September 3. Principal times were: King's Cross dep., 10.28 a.m.; Finsbury Park, 10.35½; Potter's Bar, 10.52; Hatfield, 10.58; Knebworth, 11.6½; Stevenage, 11.10½; Hitchin, 11.14; Biggleswade, 11.21½; Sandy, 11.24; Huntingdon, 11.37; Abbots Ripton, 11.42; Holme, 11.47; Peterborough, 11.54; Essendine, 12.9; Little Bytham, 12.13½; Corby, 12.20; Stoke, 12.24; Grantham, arr. 12.30.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A.M.Inst.T., A.I.Loco.E.

Photo.] [*Patrick V. Williams.*

GREAT WESTERN RAILWAY.

Down fast goods train approaching Didcot.
2-8-0 locomotive of "28" class.

WITHOUT wasting time in preliminaries, I wish to embark straight away on the description of a number of recent journeys on the London and South Western and London, Brighton and South Coast lines, made with the aid of facilities kindly granted by Sir Herbert Walker, K.C.B., and Sir William Forbes, the respective General Managers of these two companies. An additional feature of interest in connection with the Brighton trips was that, by permission of Mr. L. B. Billinton, Locomotive Engineer of the London, Brighton and South Coast Railway, I was accorded the privilege of a place on the footplate of one of the large 4-6-4 express tank engines in each direction between Victoria and Brighton, the train concerned being the "Southern Belle." With the aid of the tabular statement of times appended, I will deal with these runs first.

Readers hailing from the South of London do not need to be informed that the loading of the "Southern Belle," since the substitution of third-class Pullman cars for the previous non-corridor stock, has undergone a considerable increase. There is a tendency on the part of certain contemporaries somewhat to over-estimate this load; this tendency probably arises from a misconception as to the weight of the third-class Pullmans incorporated in this formation, which is 32½ tons apiece, as against the 40 tons of the first-class cars. Even the maximum of 11 Pullmans that has been mentioned elsewhere, assuming that, at most, four were first class and the remainder third, would only tare 388 tons, or less than the "400 tons and over" so freely cited, and this is a very exceptional formation; the biggest Saturday load that I have noted was one of nine Pullmans and a brake—only two of them 12-wheelers—making a tare total of 330 tons, and this was the train figuring in the footplate runs about to be described. A very full train would not effect an increase of more than 6 or 7 per cent. at most in these figures; I calculated that on my two Saturday journeys the gross load was 350 tons each way. Not that I would for one moment attempt to depreciate the work performed on these 60-minute trains, which is, in such onerous loading conditions, exceedingly fine; the matter is only mentioned in the interests of accuracy, and to confirm the reasonable official estimate of the weight of this train,

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which is given at an all-the-year-round figure of 320 tons to 350 tons. The most difficult of all the 60-min. turns is probably the 6.35 p.m. out of Victoria; we met this train at speed the other night—a Friday—and as far as I could see the make-up consisted of at least 13 bogie vehicles, three of them Pullmans, with a number also of the 26-ton "ironclad" cars. I should be glad to hear from any well-informed reader as to the maximum loading seen on any of these 60-min. expresses, and especially the train last-mentioned.

My two footplate trips were made on

Photo.] LONDON, BRIGHTON & SOUTH COAST RAILWAY. [*F. E. Mackay.*

"Southern Belle" express (1st and 3rd class Pullman cars).
4-6-4 tank engine, No. 327, "Charles C. Macrae."

No. 333, the latest of the 4-6-4 batch. On the outward journey she was in charge of Driver Horsman and Fireman S. Clark, of Brighton shed, the day being a Saturday in mid-July—one of those peculiarly characteristic "summer" days which have distinguished the past season of that name, with a thick mist, drizzling rain, and, consequently, a greasy rail. To add to this handicap, we had a discouraging series of checks at the start, commencing at Battersea Park—after a fine start up the 1 in 61 to Grosvenor Bridge—and renewed through Croydon, where we were again slowed to 15 m.p.h. After both checks, also, we had to run cautiously owing to a succession of "distants" at danger, although on the level stretch beyond Balham Junction we worked up to fully 57 m.p.h. at Streatham Common, after some very rapid acceleration.

Beyond Coulsdon we were not further troubled, and regained nearly 2 min. to Keymer by some fine running after Quarry. We passed Earlswood at 65 m.p.h., Horley at a sustained 72½, Gatwick at 69, Three Bridges at 60, Balcombe Tunnel Box at 50, Hayward's Heath at 71½, and Keymer at 75, again well sustained; a good ascent was made to Clayton Tunnel, which we entered at 60 m.p.h., and left at 54, while the maximum rate before Preston Park was 66 m.p.h. It is a pity that the sharply curved platform at Brighton requires so rigorously restricted a speed of approach; on this occasion our net time to Preston Park, 49·6 miles, was not more than 54 min., or very slightly over, as we had run the 30·8 miles from Quarry in exactly 29 min., but the last 1·3 miles to the stop required all but 3 min. Throughout the journey the engine was worked under perfectly easy steam, cut-off averaging about 35 per cent., and the regulator being kept at one-half to three-fifths open on the ascending grades; pressure was kept

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consistently at the 170 lb. mark at the expenditure of what appeared to the observer an unusually moderate consumption of fuel.

Another journey behind the same engine, when I was a passenger, appears in the adjacent column. This was notable by reason of an entire absence of checks and Coulsdon, and 44 at the entrance of Merstham Tunnel, but we sustained 69 m.p.h. past Horley and were through Three Bridges and Keymer 1½ min. early. Minimum at Balcombe Tunnel was 50½ m.p.h., but from there onwards we went very easily, not getting above 66 m.p.h. at Wivelsfield, nor above 57 at Patcham,

L. B. & S.C.R.—VICTORIA-BRIGHTON.

333 4-6-4T 46 330 350	422 4-4-2S 40 290 305	41 4-4-2N 42 315 330	Schedule.	Distance.	Engine No. : Engine type : Load (axles) : Load (tons tare) : Load (tons full) :	Distance.	Schedule.	333 4-6-4T 46 330 350	333 4-6-4T 42 315 330	Schedule.	43 4-4-0N 49 273 300
m. s.	m. s.	m. s.	min.	Miles.		Miles.	Min.	m. s.	m. s.		m. s.
60 45	64 00 sigs.	65 00 sigs.	60	50.9	Victoria ..	0.0	0	0 00 sigs.	0 00	0	0 00
58 15	59 30 sigs.	62 05 sigs.	—	49.6	Battersea Park	1.3	—	3 45 sigs.	3 30	—	3 45
56 00	56 00 sigs.	59 25 sigs.	55	48.2	Clapham Junct.	2.7	—	6 45	5 40	—	6 10
53 20	51 20 sigs.	55 25 sigs.	52	46.0	Balham Junct. ..	4.9	9	10 05	8 25	10	10 05
47 50	45 40	48 55	—	41.5	Selhurst	9.4	—	15 40 sigs.	13 30	—	17 00
46 15 sigs.	44 05 sigs.	47 35	45	40.4	East Croydon ..	10.5	16	17 40 sigs.	14 45	18	18 50
42 15	40 30	44 50	—	37.3	Purley	13 6	—	23 20	18 20	—	23 20
40 45	39 10	43 35	40	35.9	Coulsdon.. ..	15.0	21	25 30	20 10	25	25 35
36 20	34 55	39 10	36	32.1	Quarry Box ..	18.8	—	30 50	25 05	—	31 25
32 50	31 35	34 50	—	29.0	Earlswood ..	21.9	29	33 50	28 05	34	34 55
28 45	27 50	28 05 sigs.	—	24 9	Horley	26.0	—	37 20	31 50	—	39 00
25 30	24 55	24 30 sigs.	25	21.3	Three Bridges ..	29.6	37	40 40	35 35	42	43 05
23 10	22 40	22 20	—	19.0	Balcombe Tunnel Box	31.9	—	43 20	38 25	—	46 35
20 45	20 20	20 05	—	16.8	Balcombe ..	34 1	—	45 40	40 45	—	49 15
16 50	16 25	16 20	—	12.9	Hayward's Heath	38.0	—	49 10	44 30	—	53 10
14 05	13 45	13 45	13	9.7	Keymer Junct.	41.2	49	51 45	47 25	55	56 15
11 35	11 15	11 25	—	7.0	Hassocks.. ..	43.9	—	54 05	50 20	—	—
9 05	8 45	9 05	—	4.7	Clayton Tunnel South end	46.2	—	56 30	53 15	—	—
3 45	3 40	4 05	—	1.3	Preston Park ..	49.6	—	59 50	57 05	—	—
0 00	0 00	0 00	0	0.0	Brighton ..	50.9	60	62 45	59 45	—	—
59½	57½	57	60	50.9	Net times (min.)	50.9	60	58	59¾	*67	*68¼

T Superheated tank engine. S Superheated tender engine. N Non-superheater tender engine.

* Times to Lewes, 50·2 miles.

an especially fine start, whereby, with 330 tons, we passed Clapham Junction at 49 m.p.h., only fell to 45½ at Balham and accelerated to 58½ at Streatham, and passed Croydon at 53½ m.p.h., 1¼ min. ahead of time. A slight easing followed to Quarry, speed dropping to 49½ m.p.h. at Purley, 44½ at the short tunnel beyond while the lowest rate on leaving Clayton Tunnel was 45½ m.p.h. If the Victoria-Quarry and Preston Park–Brighton times of this run be added to the Quarry–Preston Park time of the first trip, a running time of 56¾ min. is left—no mean achievement with a load of this magnitude over a road which, though not of excep-

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tional difficulty, has some lengthy gradients, especially from Victoria out to Quarry.

The last down run was on the 3.20 p.m. Eastbourne train, on which one of the Billinton 4-4-0 engines made rather a poor show, being behind time all the way. The load, however, was fairly heavy for this type of engine, being all but 50 axles, and, even though made up of light non-corridor stock, very substantially filled. At Balham Junction we fell as low as 31 m.p.h., and at Streatham Common did not rise above 44; at Selhurst the rate was 39½ m.p.h., and at Merstham

This was not an exhilarating experience, but the work of another engine of the same type, on the 5.10 p.m. up 90-min. non-stop, was tragic, despite a most moderate 220-ton load of 36 axles. We got through Lewes in 22 min., as booked, but it then took us no less than 15 min. 50 sec. to struggle up the 9 miles to Keymer, allowed 12 min. Thence we lost another minute to Croydon, where, of course, we were immediately in the path of the 5.45 p.m. up "Belle," and endeavoured to recoup this by running over the junction at Windmill Bridge at 55 m.p.h., through Clapham Junction at 53,

Photo.] LONDON, BRIGHTON & SOUTH COAST RAILWAY. [*F. E. Mackay.*

3.40 p.m. Victoria–Brighton express. Superheated 4-4-2 locomotive No. 421.

Tunnel about 33. Down the falling gradients, like the chariots of the Egyptians, we "drave heavily"; 64 m.p.h. was the maximum at Horley, and 66 at Wivelsfield, before we slacked for Keymer Junction. The lowest rate at Balcombe Tunnel was 41 m.p.h., and the tempting descent from Plumpton to Lewes produced no higher speed than 62½ m.p.h., so that we took 68 min. 20 sec. for the 50·2 miles, instead of the 67 min. allowed. From Lewes to Eastbourne, 15·1 miles with a sharp ascent from Southerham Junction to Glynde, and a bad slack through Polegate, we took 5 sec. under the 23 min. allowed.

and over Poupart's Junction, in the facing direction, at 45! On the descent past Three Bridges, where high speed would have been acceptable, the driver actually shut off steam after reaching 62½ m.p.h., and dropped to 55 at Horley. Had we not been stopped on Grosvenor Road bank, we might have arrived in 91½ min. from Eastbourne (having passed East Croydon in 77¾ min.) as a result of the spirited running in the suburban area previously mentioned, but as it was, our total time was 93¾ min. The only extenuating possibility is that there may have been some temporary defect in the engine to account for this slack running; I had

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no time to enquire this on arrival. But it is a curious thing that on the run with the 5.45 p.m. up "Belle" later the same week, about to be described (behind No. 41), we were delayed badly by the same train, the delays in this latter case commencing as far back as Three Bridges.

There were no features of special note about my up footplate journey on the 1.20 p.m.; No. 333 was again the engine, driven in this direction by H. Funnell and fired by H. Fleet, another Brighton crew. Up the 1 in 264 to Clayton Tunnel we worked at 40 per cent. cut-off from the start as far as Patcham (the first 3 miles or so) and then at 35 per cent. practically all the way to town, the regulator remaining in the three-fifths position. We entered Clayton Tunnel at 44 m.p.h., maintained 71½ past Wivelsfield, topped Balcombe Bank at 53½ and reached 69 at Horley, passed Quarry at 50, but owing to slipping in the tunnel left the latter at 45 m.p.h., and then touched 64½ m.p.h. before getting signals on from Purley to Croydon. Net time was thus inside the hour, but we might still have effected a punctual arrival had it not been for the very great caution displayed at Balham, Clapham and Poupart's Junctions. So we took 60¾ min., but it is clear from the foregoing particulars that the big engine was working well within capacity, and that 400-ton loads and more would occasion no distress, should they at any time become necessary. The features of the locomotive that struck me particularly were the comfort and roominess of the cab, and the fine look-out ahead over a boiler of such large diameter; the latter, made possible by the extreme height of the footplating above rail, was in my experience unique for an engine of this size, and, further, of considerable value over a route of such "intensive" signalling as the Brighton.

Photo.] **LONDON, BRIGHTON & SOUTH COAST RAILWAY.** [*A. B. MacLeod.*

3.50 p.m. Brighton–London train leaving Brighton Central Station.
Non-superheated 4-4-2 locomotive No. 39, "La France."

On the two remaining trips some exceedingly fine work was performed, with but slightly inferior loads. It should be remembered also that the tender engines may be credited with from 10 to 20 tons extra on their train-loads as compared with the tanks (this is not allowed for in the table), in view of the increased weight of a separate tender over a fuel and water supply carried on the main frames. No. 422 had a train of two 12-wheeled and six 8-wheeled Pullmans, with a bogie van; No. 41 hauled a similar train, less the 18-ton van and *plus* another 12-wheeler. The superheated engine got away a little the faster of the two, but

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from Preston Park onwards No. 41 was gaining all the way on her rival till the signal checks supervened. Clayton Tunnel was entered at 45 and 48½ m.p.h. (an exceedingly fine figure, the latter, representing as it does a consistent acceleration with 330 tons up a continuous grade of 1 in 264); Wivelsfield was passed at 71½ and 75 m.p.h., well sustained; Balcombe Summit was topped on both runs at 56½ m.p.h., after 8 miles' climbing, almost exclusively at 1 in 264; beyond Three Bridges No. 422 kept up 75 m.p.h. for fully 2 miles, and No. 41 reached 70½, even after the first slight signal check, before being pulled up to 20 m.p.h. at Horley. No. 422 passed Quarry at 53 m.p.h., after 7 miles up, steepening from 1 in 200 to 1 in 264, but slipped somewhat in the tunnel, from which we emerged at 45; No. 41 was only doing 44 at Earlswood, and maintained that rate practically without variation to the summit. The maximum rate at Purley on both runs was 69 m.p.h., after which came a whole succession of delays; net times are not easy to assess, but clearly the work of both engines was well inside schedule requirements. No. 422 was ably driven by C. Parker, of Brighton shed. Observation of such runs as these proves yet once again how far-sighted has been the enterprise of the Brighton locomotive authorities in building engines of such size and power as the eight 4-6-4 tanks, the two 4-6-2's, and the 11 powerful "Atlantics"; on some hands they were decried when constructing as "unnecessary," but time has ultimately proved their speed and haulage capacity to be of real value to the Brighton Company.

A Portsmouth run on the 11.35 a.m. non-stop to Fratton may be dismissed in a few words, Billinton 4-4-0 No. 67, unrebuilt, having a featherweight load of six vehicles, including Pullmans, weighing in all only 160 tons, in which circumstances the awkward grades of this route afforded no difficulties. We passed Clapham Junction in 5 min. 40 sec., and Balham Junction in 8 min. 40 sec.; signals were on thence to Mitcham Junction, which was breasted in 14 min. 55 sec. (8·7 miles); the steep ascent to Sutton, 12 miles, passed in 20¾ min., brought us down to 30 m.p.h. We touched 54 m.p.h. before slacking to 30 at Epsom (15·8 miles, 25½ min.), and 64 before Dorking, 23·9 miles, passed in 35¾ min. On the 1 in 100 before Holmwood we fell

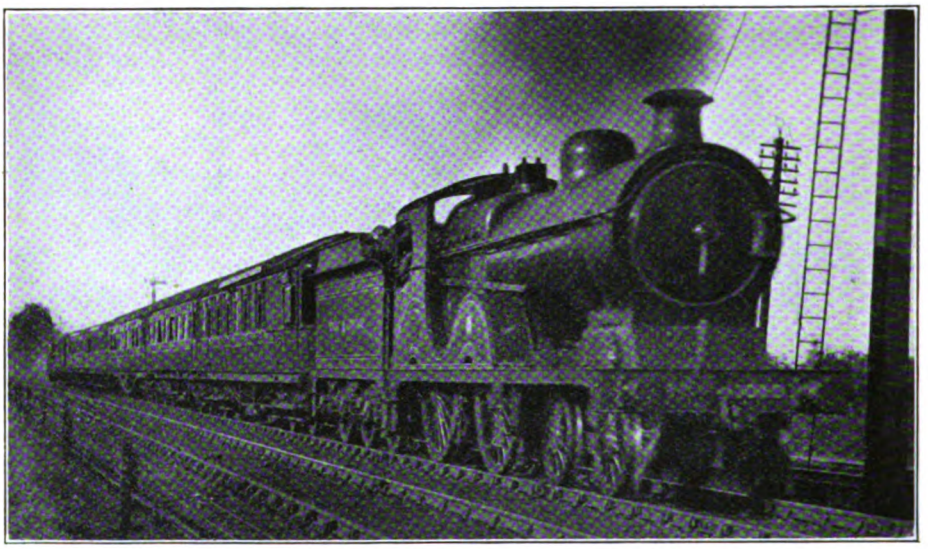

Photo.] **FROM THE GRANITE CITY TO THE CORNISH COAST.** [*J. G. Irving.*

Train conveying 9.45 a.m. *ex* Aberdeen through carriage for Penzance, passing at 6.45 p.m. Monk Fryston, York–Sheffield section, North Eastern Railway.
Great Central Railway re-built and superheated 4-4-0 locomotive No. 1018.

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to 30½ m.p.h., and most of the subsequent winding descent to Horsham, save for a momentary maximum of 64 m.p.h., was negotiated at an average of 55 m.p.h. After touching 65 m.p.h. at Billingshurst, we slackened for Pulborough, and thereafter, being well on time, we simply ambled, never so much as reaching the mile-a-minute rate again on the tempting stretches of level line that follow. Ockley, 31 miles, was passed in 46 min. 5 sec.; Horsham (at 30 m.p.h.) 37·3 miles, in 53 min. 20 sec.; Pulborough, 49·6 miles, in 67 min. 25 sec.; Arundel, 58 miles, in 76 min. 40 sec.; Barnham Junction, 63 miles, in 82 min. 40 sec.; Chichester, 69.2 miles, in 90 min. 20 sec.; Havant, 78 miles, in 101¾ min. (including a p.w.r. caution at Emsworth); and Fratton, 84·4 miles, was reached in 110 min. precisely, as booked. Net time was about 108 min.—an uninspiring, though punctual effort—and I suppose the time of exactly one hour from Ockley to Portcreek Junction, 50·6 miles, including the slacks at Horsham, Pulborough, and Emsworth, as well as the cautious running over certain sharply curved sections, was reasonably good.

We come now to the London and South Western runs, which consist of two in each direction between London and Bournemouth, and one from Waterloo to Exeter and back, on all of which I travelled as a passenger, and no communication whatever was made with drivers either before or after any run. The Bournemouth journeys are tabulated herewith. On the 12.30 p.m. down, a load of thirteen 8-wheelers, weighing 351 tons empty, and 380 tons gross, was more than the large Drummond superheated 4-4-0 No. 467 could manage, and we dropped 4¾ min. to Southampton. The start was sluggish; we were only doing 56½ m.p.h. at Hampton Court Junction, and 58½ at Byfleet, while we fell to 50 at Weybridge and 40 at milepost 31; from Farnborough to Basingstoke we ran at between 48½ and 57 m.p.h., and then fell to 39 beyond Battledown; beyond Litchfield we accelerated very gradually to 71½ m.p.h. at Winchester, and then, to my utter astonishment, with all signals clear and a road perfectly aligned for the very highest speeds, brakes were employed sharply to reduce the rate to below 65 at Shawford! Even with fast running later, and a record finish into Bournemouth Central, we dropped a further 2 min. from Southampton. This made 6¾ min. in all against engine from Waterloo—a poor exhibition, except that the load was distinctly on the heavy side.

No. 424—a rebuilt and superheated Drummond 4-4-0 of the penultimate batch—made a much better show on the 10.30 a.m. down, although the load was, of course, far lighter, being only 10 non-corridor "eights" and a "six" weighing in all some 270 tons. We were doing 45½ m.p.h. at Clapham Junction, fell to 43 on the subsequent short 1 in 144 up, passed Wimbledon at 50½ m.p.h., Surbiton at 60, Weybridge at 55, Byfleet Junction at 61½, mile-post 31 at 48½, Farnborough at 60, Winchfield at 52½, and Basingstoke at 52 (subsequent to a maximum of 61½ beyond Hook), after which we eased considerably, being on time, and dropped to 40 m.p.h. beyond Battledown. On the falling grades beyond Litchfield we touched 70½ m.p.h. at Waller's Ash, and maintained mostly a steady 69; slackening then to 56 for Eastleigh and 15 for Northam Junction, we reached Southampton in 90½ min., 1½ min. early. Here the load was reduced to six 8-wheelers, but the driver now took things so easily, especially after Christchurch, that by this slack running we took 20 sec. over the 36-min. allowance on to Bournemouth.

I will deal next with the up Bournemouth journeys before describing those over the West of England route. Both of these two trips, which were behind engines of the same rebuilt type as that last mentioned (a very efficient class, from my observations), incorporated some excellent locomotive work. No. 416 started by gaining 2½ min. to Southampton with 275 tons, and No. 431 followed suit by a gain of 1¼ min. with 310 tons, the running into the platform at Southampton West being, as always from this direction, very slow. Speeds were 61 m.p.h. in both cases at Christchurch (eased on the second run to 55 through the station); up the 4-mile rise past Hinton Admiral, finishing with a mile at 1 in 111, the minima were 45½ and 43½ m.p.h.; the top speed on Sway bank was 70½ m.p.h. on both runs between Brockenhurst and Beaulieu

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Road, after which, on the rising grades which follow, speed at no time fell below 53½ and 54 m.p.h. Descending to Totton 60 m.p.h. was the highest speed allowed on either run, and with a careful slowing over the curve into Millbrook we effected the gains on schedule already mentioned.

On re-starting from Southampton, both engines again did excellently out to Eastleigh, passed at 52½ and 53 m.p.h., in each case with a minute in hand; then No. 431 was unfortunate enough to be brought down by signals to 38½ m.p.h. at Shawford Junction. No. 416 passed Winchester at 44½ m.p.h., and Micheldever hard, getting up to 70½ m.p.h. at Fleet, only falling to 60 at mile-post 31, passing Brookwood at 70½, Woking at 72½ and Byfleet at 75 m.p.h.—by far my fastest post-war record over this particular length—but we were unfortunately stopped for signals beyond Surbiton, and got them hopelessly on all the way from there to town, where we had dropped nearly 8 min. But I reckon the net time at not over 89½ min., and 32½ min. for the 35·8 miles from Basingstoke to Surbiton—average 66·1 m.p.h.—was a fine effort. On the basis of this running, the old two-hour non-stop schedule from Bournemouth

Photo.] LONDON & SOUTH WESTERN RAILWAY. [*W. H. C. Kelland.*

West of England express leaving Salisbury. 4-6-0 locomotive (6 ft. 7 in. class), No. 743.

at an absolute minimum of 40, afterwards recovering to 41½ at Litchfield. No. 431 accelerated from the slack to a steady and unvarying 43 all the way from Winchester Junction to the top—an altogether superior piece of work, as the latter train was by 40 tons the heavier of the two. From Wootton to Basingstoke No. 416 ran very easily; No. 431 had attained 64½ m.p.h. when we were slightly checked by signal at Worting. The two uphill times from Southampton to Basingstoke were thus practically as scheduled, net time in the second case being about 41½ min., or ½ min. under booked time.

After Basingstoke No. 416 ran very could have been maintained without difficulty. No. 431 ran more sluggishly from Basingstoke, not getting above 66 m.p.h. at Hook nor above 69 at Byfleet, although we woke up somewhat after Weybridge, and with a top speed of 67 m.p.h. from Esher to Hampton Court Junction should probably have kept time from Basingstoke to Clapham Junction but for the Coombe p.w.r. check. Net time from Southampton on this trip was about 91 min., which with this load was quite creditable.

The feature of the West of England trips is that, for the first time this summer, the large 4-6-0 engines have been working

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through between Waterloo and Exeter, with a change of crew intermediately at Salisbury. Consequently, on the 11 a.m. down, we had No. 737 throughout, and on the return journey one of the two newest of this class—No. 746—was at the head of the train all the way. To

tion and Byfleet we did not exceed 57½ and 58½ m.p.h. respectively, and fell to 45 at mile-post 31; while after reaching 60 at long last beyond Hook we fell to 47 at Battledown—indifferent work for an engine of this size and power up nothing steeper than 1 in 249. Then the accelera-

L. & S.W.R.—WATERLOO-BOURNEMOUTH (& SALISBURY).

737	467	424	Schedule.	Distance.	Engine No.: / Engine Type: / Load (axles): / Load (tons tare): / Load (tons full):	Schedule.	Distance.	416	431	746
4-6-0	4-4-0	4-4-0						4-4-0	4-4-0	4-6-0
40	52	*43						43	47	32
284	351	*250						256	282	224
300	380	*270						275	310	240
m. s.	m. s.	m. s.	Min.	Miles.		Miles.	Min.	m. s.	m. s.	m. s.
0 00	0 00	0 00	0	0 0	Waterloo	79.3	92	99 50 sigs.	97 55 sigs.	98 55 sigs.
3 40	3 55	3 35	—	1.4	Vauxhall	77 9	88	92 40	89 40 sigs.	90.45
7 15	7 55	7 30	7	3.9	Clapham Junction ..	75 4	84	89 40	86 25	87.35
11 35	12 45	12 00	—	7.3	Wimbledon	72 0	—	85 50 sigs.	82 35 sigs.	83.45 sigs.
17 05	18 40	17 25	—	12.1	Surbiton	67 2	—	75 00	76 45	75 45
24 45	26 25	24 50	—	19.2	Weybridge	60.1	—	68 20	70 20	69 15
30 35	32 20	30 15	29	24.4	Woking	54.9	64	63 55	65 35	64 35
38 55	41 45	38 05	—	31.0	Mile-post 31 ..	48.3	—	57 35	59 10	58 30
41 30	44 35	40 30	—	33.3	Farnborough ..	46.0	—	55 25	56 50	56 15
51 20	55 05	50 10	—	42.3	Hook	37.0	—	47 15	47 45	47 40
57 20	61 10	56 00	56	47.9	Basingstoke ..	31.4	42	42 30	42 30 sigs.	42 30
60 25	64 35	59 15	59	50.4	Worting Junction ..	28.9	—	39 40	40 00	40 25
Overton	72 45	67 05	—	56.2	Litchfield Box ..	23.1	—	32 35	33 20	Overton
66 45	82 20	76 30	—	66.7	Winchester ..	12.6	—	17 50	18 35 sigs.	35 05
Hurst-bourne	88 15	82 40	83	73.6	Eastleigh	5.7	10	9 00	9 10	Hurst-bourne
72 00	94 00	88 00	88½	78.2	Northam Junction	1.1	—	2 55	3 00	28 45
Andover	96 40	90 30	92	79.3	Southampton W. ..	0.0	0	0 00	0 00	Andover
76 40	0 00	0 00	0	0.0		28.7	37	34 35	35 50	23 15
P.w.r.	7 20	6 00	6½	3.3	Totton	25.4	—	29 10	30 10	—
Grateley	11 35	9 35	—	6.1	Lyndhurst Road ..	22.6	—	26 10	27 10	Grateley
84 05	20 40	17 30	18	13.5	Brockenhurst ..	15.2	20	18 50	19 55	17.15
Porton	24 30	21 00	—	16.3	Sway	12.4	—	16 00	17 05	Porton
90 55	30 40	26 50	—	21.8	Hinton Admiral ..	6.9	—	9 40	10 20	9 20
Salisbury	33 35	29 55	—	25.0	Christchurch ..	3.7	—	5 55	6 30	Salisbury
96 55	38 05	36 20	36	28 7	Bournemouth Cen.	0 0	0	0 00	0 00	0 00

Mileages of stations shown, Overton to Salisbury inclusive:—ex Waterloo: 55.7 (Overton), 61.2, 66.4, 72.8, 78.3 and 83.8 (Salisbury); ex Salisbury: 5.5 (Porton), 11.0, 17.4, 22.6, 28.1 and 33.4 (Worting Junction).

Schedules (down): Andover, 76 min.; Salisbury, 95 min.; (up) Andover, 23 min.; Basingstoke, 43 min.

* 24 axles (155 tons full) from Southampton.

Salisbury, on the down journey, the work was without inspiration; with so moderate a load and a p.w.r. check in view at Grateley, one might have expected the driver to have a minute or two in hand, rather than keep just behind time all the way to Andover, and so be 2 min. late into Salisbury. At Hampton Court Junc-

tion down 3¼ miles at 1 in 550 from Oakley down to Overton was so appallingly poor that at the end of it we were only travelling at 59 m.p.h.! Such work was obviously not characteristic of the capabilities of Mr. Urie's fine engine. We touched 69 m.p.h. at Hurstbourne and 72½ at Andover; after the check the acceleration

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from Grateley down 2¾ miles at 1 in 440–735 produced 54 m.p.h.!—time was being practically thrown away—although we did then reach 75 m.p.h. on the steeper descent before the Salisbury stop.

Beyond Salisbury the work was but little better, even after the change of crew. We took 24½ min. up to Semley, 17·6 miles, and 35 min. to Templecombe, 28·4 miles, mile-post 113½ being passed 2¼ min. later; Yeovil Junction, 39·1 miles, was passed in 46 min. 50 sec. (we had now dropped nearly a minute, in addition to starting from Salisbury 2¼ min. late), and mile post 126¼ 4 min 35 sec. later; this journey (up grades for details of which readers should consult the profile given in the November issue a year ago) were 42 m.p.h. at Tisbury, 36½ at mile-post 113½, 40 at mile-post 126¼, 25½ at mile-post 133, and 24 at Honiton Summit, the maxima (in most cases severely restrained by brakes) being 71½ at Gillingham and 72½ at Abbey Ford, 65 at Sherborne, 72½ at Axminster and 75 at Broad Clyst.

No. 746 did much better with a 265-ton nine-coach train in the opposite direction. We passed Exmouth Junction in 3¾ min., were doing 66 m.p.h. at Pinhoe and only fell to 40 on the 1 in 100 beyond Whimple,

Photo.] LONDON & SOUTH WESTERN RAILWAY. [*F. E. Mackay.*

Portsmouth luncheon car express. Rebuilt and superheated 4-4-0 locomotive, No. 419.

adverse signals at Hardington brought us down to 32 m.p.h., and we took 58¾ min. to Crewkerne, 47·9 miles, and 62 min. to mile-post 133 summit, 49·2 miles; then we breasted Axminster, 61 miles, in 73 min. 40 sec., mile-post 152½ (Honiton Summit), 68·7 miles, in 86 min.; after which Sidmouth Junction, 75·8 miles, was passed in 94¼ min., Exmouth Junction, 86·9 miles, in 105 min., and we made Exeter, 88 miles, in 107 min. 20 sec. (105 min. net as against 104 min. booked), and nearly 6 min. late, gravely imperilling my connection with the 2.30 p.m. up, which, however, fortunately got away a minute or so late. Minimum speeds on so getting through Sidmouth Junction in 17 min. 50 sec.; then, touching 64 on the little subsequent dip, we went up the 4½ miles, mostly at 1 in 100-90, to mile-post 152½ (passed in 25 min. 40 sec., 19·3 miles) without speed falling below 32 m.p.h. Twice we reached 75 m.p.h. down Colyton bank, with intervening brake applications, but right at the foot we unfortunately encountered a p.w.r. check, so taking 35 min. to Axminster, and getting a poor start thence up the long rise to Hewish. Despite that we accelerated up 3½ miles at 1 in 240–225 from 40 to 48½ m.p.h.; increased further to 50 up 2 miles at 1 in 140–220 and then

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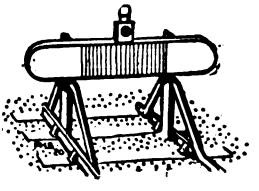
to 53½ over the next mile, at level and 1 in 400 up (to Chard Junction); fell to 45 m.p.h. on the subsequent mile at 1 in 120, and maintained that speed up the remaining 1 in 200–120–160 to the summit (mile-post 133), passed in 9 min. 5 sec. This was excellent work.

On Crewkerne bank we were not allowed to exceed 71½ m.p.h.; we passed Crewkerne in 50¾ min., and mile-post 126¼ in 56 min. (at 50 m.p.h.—another good uphill effort) reaching Yeovil Junction in 60 min. 10 sec., or 58 min. net. The allowance is 60 min. From Yeovil Junction we reached 55 m.p.h. at Sherborne, topped Sherborne bank at 32½, and made Templecombe in 16 min. 10 sec., instead of the 17 min. allowed. Leaving Templecombe we touched 53 m.p.h. at Abbey Ford and 61½ at Gillingham, with an intervening minimum of 33 at the tunnel; then we went up to Semley, passed in 15 min. 20 sec., at a minimum of 36 m.p.h. on the 1 in 100. Most moderate downhill speeds followed, nowhere exceeding 64 m.p.h., and when we slacked, as usual, through Wilton, having covered this 25·9 miles in 31 min., there was every prospect of completing the 28·4 miles into Salisbury in 1½ min. under the 36 min. allowance, had we not been stopped by signal outside. So the engine had some 4½ min. to her credit from Exeter to Salisbury.

On to London, with a lighter 8-coach load of 240 tons and a late start of 4 min., the running was to time, except where delayed by signal, but rather respectably dull. Minimum on the 1 in 140 of Porton bank was 35½ m.p.h., recovering to 40 on the 1 in 245, but we were not allowed to exceed 67 at Andover. It was a singular coincidence that the time from Salisbury to Basingstoke tied precisely with that of the two preceding trips from Bournemouth. Beyond Basingstoke we touched 72½ m.p.h., and speed then ranged from 60 at Hook and 66 at Fleet to 58½ at mile-post 31, 70½ at Woking, and 69 sustained from Esher to Hampton Court Junction (quite good, this last); but then came an exceedingly bad signal and p.w.r. check at Coombe, which, with the usual succession of checks beyond Vauxhall, and a stop at "Doulton's Halt," as I heard a wag the other day describe the last half-mile or so into Waterloo, brought us in 10 min. late, in 98 min. 55 sec. from Salisbury. Net time from Salisbury was probably 91 min., or a little less, instead of the 93 min. allowed.

In next month's issue I hope to detail the results of a journey on the footplate of one of the large 4-cylinder 4-6-0's of the Hughes (*ex*-Lancashire and Yorkshire) type over the main line of the London and North Western Railway from Crewe to Carlisle on the 1.15 p.m. non-stop Glasgow express, and with this experience I want also to detail some workings of London and North Western engines over Division "B," in competition with various Lancashire and Yorkshire types. Such first-fruits of grouping foreshadow what will in all probability prove one of its greatest sources of fascination, for the time being at least—the working of locomotives over routes which have been to them as foreign territory hitherto.



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"Parallel" Traffic Working on the South Eastern & Chatham Railway.

AS one of the great residential traffic railways serving the Metropolitan area, and notwithstanding the preparation of plans for the electrification of suburban lines on an extensive and very complete scale, the chief officers of the South Eastern and Chatham Railways' Managing Committee have for a long time been faced with an urgent immediate demand for increased services, especially in regard to the morning pressure of trains arriving at the London termini between 9 and 10 a.m. This need was most pronounced in respect of the trains passing through London Bridge, towards Cannon Street or Charing Cross. For several years past no ordinary trains have been scheduled to serve both termini, and to that extent the complications due to the conflicting movements of trains entering Cannon Street *en route* to or from Charing Cross do not now apply. But to meet the demands of growing traffic, including additional main line trains bringing season-ticket holders from relatively distant residential centres, it has been necessary to add more and more trains, with the result that, although prior to February 13, 1922, no fewer than 36 up trains were booked through London Bridge Station between 9 and 10 a.m., there was urgent need for further additions, while it was difficult to secure punctual working under the conditions then obtaining.

Seeing that London Bridge high level station has three down and four up lines, that in places even more lines exist on the London Bridge-Southwark Park section, and that two up and two down routes are available from London Bridge right into Cannon Street, there may be a tendency to suggest that the problem was not really so difficult. Consideration of the train services concerned, and of the track lay-out, in conjunction with explanatory remarks, will indicate, however, how complex was the problem actually involved.

For example, of the 36 up trains previously worked through London Bridge station between 9 and 10 a.m., quite a number came from long distances, several being important expresses, others reached London Bridge from the London, Brighton and South Coast system, transferring to the South Eastern and Chatham Railway at London Bridge "B" cabin, but otherwise being associated with Brighton train working; while South Eastern and Chatham local trains came from numerous routes, their interworking being governed by the track arrangements and junctions at several crucial traffic points. This question of track approach to London Bridge is, as will be seen, a governing factor, for while there are, in effect, at least three lines in each direction for a considerable distance, the junctions and connections concerned complicate train working to a very appreciable degree.

At London Bridge station itself, moreover, the stops made by all but two of the trains concerned were by no means nominal or necessarily of a few seconds duration, for large numbers of passengers detrain there, and still larger numbers interchange between Cannon Street and Charing Cross trains. Thence to Borough Market Junction trains for both destinations use one of the two up lines available, while up Cannon Street trains have to cross the path of down trains from Charing Cross. And in order to reach the necessarily varying platforms at Cannon Street, a complicated system of crossovers and connections has to be traversed in crossing the bridge over the river.

The problem involved was, therefore, an exceedingly complex one, and its solution, which incidentally gives actual train working possibilities which are, even now, not entirely utilised, has necessitated close study and detail revision of train services throughout the entire system. It is, in fact, the result of lengthy consideration and preparation on the part of a committee appointed by the General Manager last year, and represents the application of traffic methods which include important and valuable features. It is, indeed, not claiming too much to suggest that the result of the labours of this committee is to advance very materially the "science of railroading," and it is mainly from that

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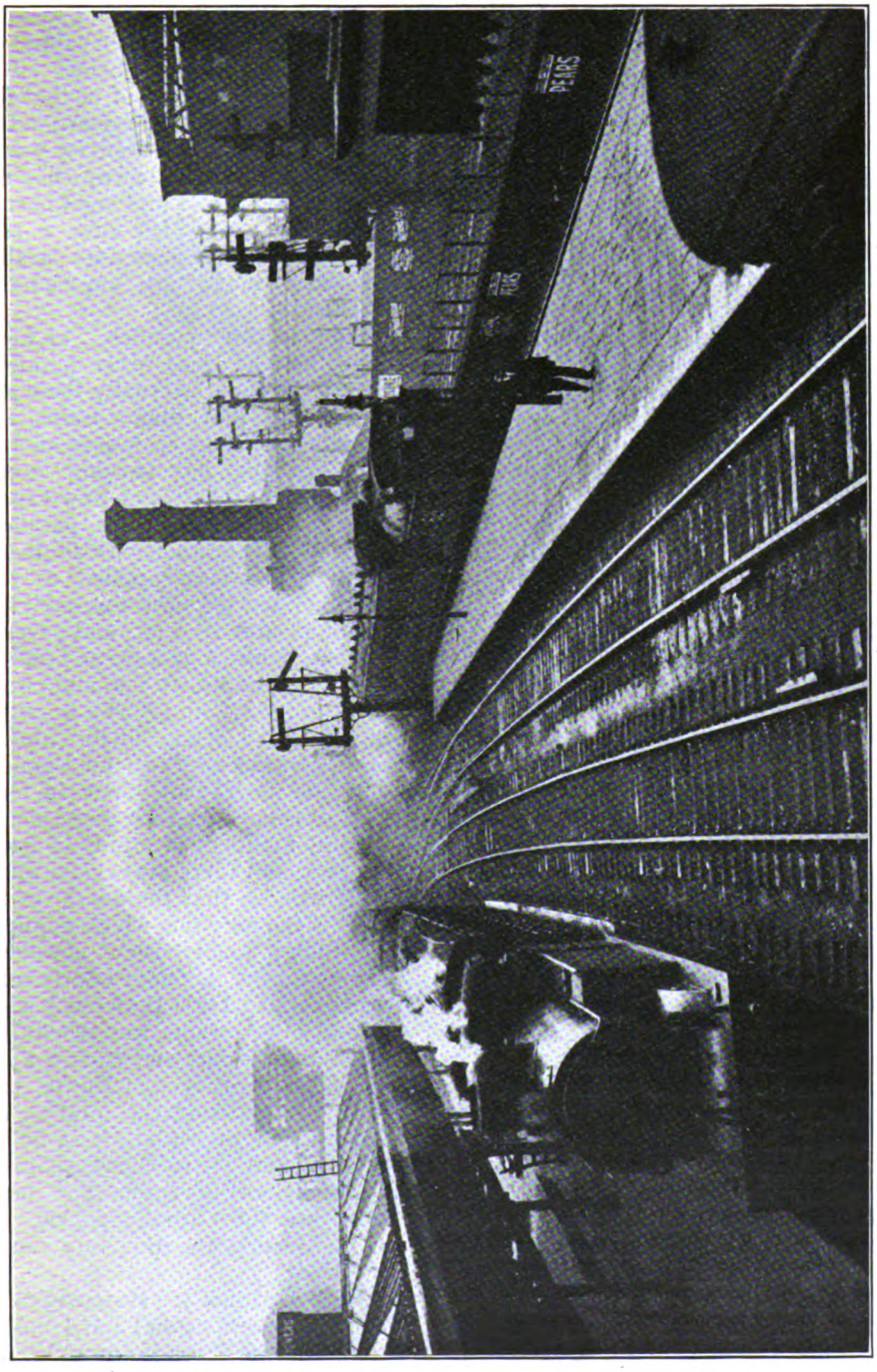

9.0 A.M. ORPINGTON TO CANNON STREET (LEFT) AND 9.5 A.M. BROMLEY (NORTH) TO CANNON STREET (RIGHT) ENTERING LONDON BRIDGE (HIGH LEVEL) STATION.

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point of view that we have welcomed the opportunity afforded by the courtesy of Mr. P. C. Tempest, C.B.E., General Manager, for describing what has been done, and indicating the underlying principles which have governed the compilation of the new time-tables.

The root principle adopted is that which is best described as "parallel" working; that is, scheduling trains so that (1) at junction points, up and down trains on the same routes will pass at the same times, thus avoiding conflicting movements due to route divergence or confluence; and (2) where multiple tracks are available trains are scheduled to run parallel, and directed so that not only two up but also two down trains will be given simultaneous non-conflicting paths.

This is most clearly indicated by considering the East and West up and down lines between London Bridge and Borough Market Junction, though the same principles apply elsewhere, as will be seen. By scheduling two up trains to leave platforms 1 and 4 at London Bridge for Cannon Street, they can both be given clear parallel paths through the Junction. Meanwhile, two down trains from Cannon Street are scheduled to pass Borough Market Junction at approximately the same time as the two up trains mentioned. This is further carried out by routing the trains to or from platforms at Cannon Street so that all four have clear paths between London Bridge and Cannon Street. Intermediately of these sets of four trains, two Charing Cross trains are dealt with. Thus, an up train from No. 2 platform at London Bridge is able to diverge at Borough Market Junction, and at the same time a down train from Charing Cross passes, and thus avoids any conflict with either up trains to or down trains from Cannon Street.

Between 9 and 10 a.m. the general system is that six trains leave London Bridge every four minutes, two "parallels" for Cannon Street simultaneously, and one intermediately for Charing Cross, the down "parallels" corresponding at Borough Market Junction, which is, therefore, the controlling point. In practice, only 10 "parallels" are scheduled for up trains between the hours mentioned, whereas 15 are possible, and this gives the needed latitude, without which too rigid a system would break down, seeing that a train here and there must occasionally fail to keep its exact arrival time, due probably to conditions far down the line.

Several up trains are placed in sidings at Charing Cross or Cannon Street after arrival, or otherwise disposed of, so that the down services do not exactly correspond.

There are five instances between 9 and 10 a.m. when a four-minute sequence includes one Cannon Street and one Charing Cross train only, in which case a late running train which has missed its parallel can sometimes make an unscheduled parallel instead.

In addition to the "parallels" at London Bridge there are also other parallels further down the line. Actually there are several more, in that many trains are booked parallel for short distances on the multi-track section, but varying stops, particularly at St. John's and New Cross, cause them to be, in some cases, parallels first with one train and then with another.

The system has been applied to the entire morning service of trains arriving between 7 a.m. and 10 a.m., and several parallels occur before 8.52 a.m. at London Bridge, as, for example, at 7.36 a.m., 7.44 a.m., 7.48 a.m., 8.24 a.m., 8.28 a.m., 8.32 a.m., 8.36 a.m. and 8.48 a.m., all for Cannon Street, and sequences of two for Cannon Street and one for Charing Cross in four minutes are scheduled on several occasions. But the total numbers of trains in each hour are fewer, and there are several four-minute intervals, so that the 9 a.m. to 10 a.m. period is the only one which requires detailed study. Obviously, however, train working during this hour affects conditions earlier and later. Between 7 a.m. and 8 a.m. 30 up trains are scheduled through London Bridge, and from 8 a.m. to 9 a.m. the number is 32. During the 9 a.m. to 10 a.m. period the total is, as already mentioned, 40, of which 25 go to Cannon Street and 15 to Charing Cross. As the proportions of traffic for these destinations are substantially 60 and 40 per cent., the trains are thus very fairly distributed.

Cannon Street trains are systematically dealt with at platforms 1 and 4 at London Bridge, and Charing Cross trains at No. 2. This permits of easy interchange, with rarely more than two minutes to wait, between Cannon Street and Charing Cross

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LEFT TO RIGHT.—6.55 A.M. HASTINGS TO CANNON STREET, 8.22 A.M. BECKENHAM JUNCTION TO CANNON STREET, 8.48 A.M. EMPTIES, CANNON STREET TO BROMLEY (NORTH), AND 8.48 A.M. CANNON STREET TO ERITH, BETWEEN LONDON BRIDGE AND BOROUGH MARKET JUNCTION.

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trains at platforms Nos. 1 and 2, but passengers for Charing Cross arriving at No. 4 have to make use of the footbridges for interchange purposes. The signalmen at London Bridge "B" cabin are, however, allowed discretion in regard to interchanging trains booked for platforms Nos. 2 and 4, both of which feed the up East line, but not in regard to No. 1, which serves only the up West line. Similarly, up trains for Charing Cross may be crossed from the East to West line at London Bridge "A" cabin, if considered desirable. To assist ready identification all trains for Charing Cross carry, during the busy period, distinctively numbered headboards, while Cannon Street trains have only the usual route indicators. During the rush period no goods trains are, of course, accepted through London Bridge, and No. 3 line, which has no platform, and which is principally used for goods and empty trains which may require to be held for a time, is therefore not concerned in traffic working.

Attention has had to be given to many other points, as indicated by the following summary of essential features :—

(1) Three minutes' headway on the same track between Hither Green Junction and North Kent East Junction.

(2) Two minutes' headway between North Kent East Junction and London Bridge station.

(3) Two minutes' headway on East Line, London Bridge "A" to Borough Market Junction.

(4) Four minutes' headway on West Line, London Bridge "A" to Borough Market Junction.

(5) Parallel working at Hither Green Junction, Park's Bridge Junction, St. John's, North Kent East Junction, Southwark Park, London Bridge, Borough Market Junction and Cannon Street.

(6) Fixed platform workings at (*a*) London Bridge High Level, (*b*) Cannon Street, and (*c*) Charing Cross.

(7) Fixed engine movements, including standing and stabling places at (*a*) Cannon Street, (*b*) Charing Cross.

(8) Fixed places for engines to take water at—(*a*) Cannon Street and (*b*) Charing Cross.

(9) Fixed workings for engines on the outward journey.

Obviously, the system has required a large number of detail alterations of train timings, not only locally, but extending in some cases to far distant points. But the service as a whole is based upon that previously in operation, altered slightly earlier or later as required, while the fact that some trains call at St. John's or New Cross or at both stations and others do not, with occasional instances of spreading out time by a minute or two, has enabled parallels to be set up at nearly all junctions, reducing checking possibilities to a minimum.

An important point, and one of which railway traffic officers will realise the full value, is that no expenditure whatever has been incurred in track alterations or signalling improvements. The difficulties due to complicated track arrangements (these have their advantages as well as their defects) and elaborate signalling have been accepted as they existed, and only to a small extent have train services been modified, and then usually for ultimate benefit.

The make-up of trains has been standardised to an important degree. This has been necessitated by the fact that terminal platforms at Cannon Street vary in length, and at certain other places a train too long for a platform may fail to clear points and thus tie up the movements of other trains until it has departed. In some cases it is necessary to insist upon a tank engine being employed, as the additional length of a tender engine may be just sufficient to prevent a train from clearing a fouling point, or there would not be room to attach the engine required for the return journey. Accordingly, the special working time-table issued to the staff specifies not only the maximum length of each train but also whether it is to be worked by tender or tank engine. At both Cannon Street and Charing Cross it has been necessary to specify standing places for engines, shunts which have to be made, places where water has to be taken, and trains to be worked in and out in very exact detail. As far as practicable, tender engines, especially those which have brought up long-distance trains, are scheduled to work main line empties to the various stabling grounds. To some extent, however, tender engines are used on local trains, and in certain instances they therefore work out corresponding trains tender first. At Cannon Street particularly, a reduction has been made in the number of engines standing idle, and reductions made in the signal movements involved to shunt them as previously required, by scheduling engines to take out trains shortly after arrival, while economy in rolling-stock user has been secured by prompt re-use for an outwards train.

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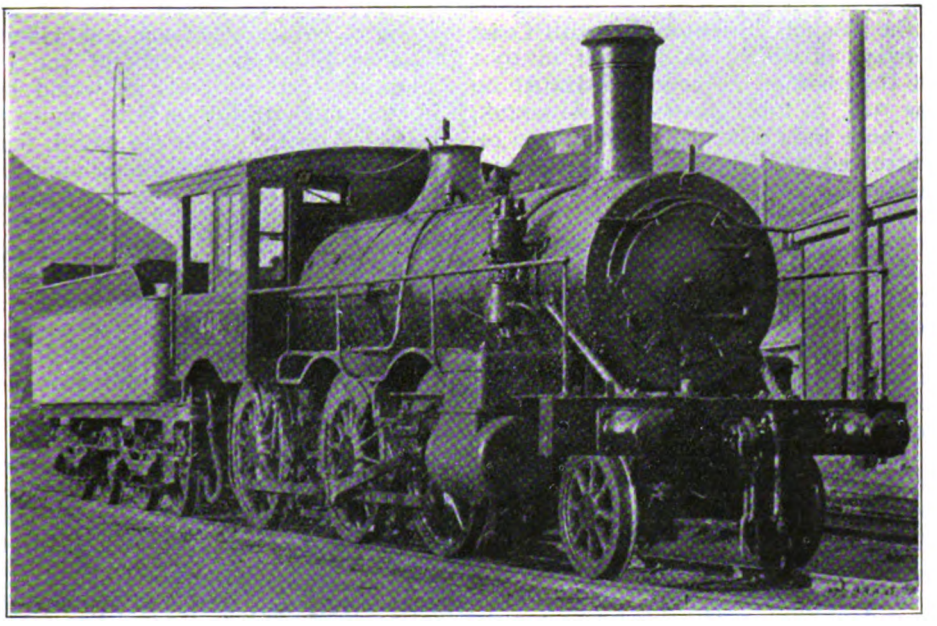
The system of "parallel" working described has proved so successful that it has since been adapted also to the down services of the week-day evening pressure. There are occasional parallels before, but the "intense" series commences at London Bridge at 5.15 p.m., from which time the 2-min. intervals are continuous until 6.31 p.m. Two trains, one from Cannon Street and one from Charing Cross, recommence the series of 2-min. intervals, but only occasionally doubled from Cannon Street, until 6.57 p.m. There are, however, Cannon Street parallels at 5.23, 27, 31, 35, 39, 47, 51, 59, 6.3, 7, 11, 19, 23, 27, 31 and 47, with one Charing Cross train intervening in every instance. In this case the platform arrangement at London Bridge is 6 and 4 for Cannon Street trains and 5 for Charing Cross trains. As 6 and 5 are on either side of an island platform, interchange is convenient, though interchange between platforms 6 and 4 involves use of the connecting footbridge.

AN AUSTRALIAN MIXED-TRAFFIC LOCOMOTIVE.



Mr. A. A. Bowles, of Sydney, New South Wales, sends a photograph (reproduced above) and particulars of a New South Wales Government Railways 2-6-0 locomotive of the L 436 class. The design is characterised by very low axle loads, and is very suitable for use on up country and pioneer lines, working mixed trains of reasonable weight and of moderate speed.

In several respects the design is suggestive of American practice, and these engines, built by Dübs & Co., of Glasgow, in 1890, but very similar to the companion series of class L 304 (built by the Baldwin Locomotive Company, Philadelphia, U.S.A.), are popularly known as "Scotch Yankees." At one time they were used on the main lines, where they figured until 1891, but since 1914 they have been almost entirely relegated to country branch lines. The L 436 class consists of 10 engines, with 18 in. × 26 in. cylinders and 5-ft. coupled wheels, the weight of engine, without tender, in working order being 48 tons. There are also 10 engines in class L 304, and these have similar dimensions, but weigh only 42 tons. The absence of a steam dome will be noted; also the large safety valve casing and top-feed arrangement recently fitted.

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Rebuilt Locomotive, No. 55, London, Brighton & South Coast Railway.

IT is now generally recognised that, although locomotives which have rendered good service for many years are now becoming out-classed for the heavier duties, they can often be modernised and their working capabilities increased to a substantial degree, particularly in regard to the boiler, and that while retaining a large part of the original engine. One of the most noteworthy instances of this is afforded by the "B 4" class of 4–4–0 express passenger engines on the London, Brighton & South Coast Railway, of which No. 55, built in 1901 and then named *Emperor*, illustrated on page 328, October RAILWAY MAGAZINE, and more fully now, has already been reconstructed by Lieut.-Col. L. B. Billinton, Locomotive Engineer.

As originally built, the "B 4" class was admirably suited to the work for which it was designed, being capable in its day of handling the heaviest and fastest trains on the line. With the progress of time and corresponding increase in the weights and speeds of trains, both having considerably advanced, the engines, as is only natural, have become outclassed for first-grade passenger traffic, and it was necessary, therefore, either to relegate them to other and lighter services or, by a process of rebuilding, bring them up to the higher standard necessitated by the greater demands of the traffic. In the earlier days there was only one 60-minute express running between London and Brighton, namely, the "Southern Belle," the weight of which was always kept down to a limit of 280 tons, exclusive of engine, whereas to-day no less than seven "hour" trains are comprised in the service, the loads of which have risen to about 350 tons or even more.

In order to meet this increase new locomotives of the 4–4–2 tender and tank and 4–6–4 tank engine types were designed and built, and at the present time these engines are handling the first-class express traffic with every satisfaction. There is, however, another class of train to be provided for, namely, those scheduled on fast timings, which make one, and sometimes two, stops between London and Brighton. These trains have so considerably increased in the matter of loads, many of them being equivalent to, and in some cases more than, the tonnage of the first-class trains—that difficulty was experienced with the "B 4" engines as they exist in hauling such trains without loss of time. The circumstances were such that many of the "B 4" locomotives had become due for heavy repairs, and the decision was taken by Colonel Billinton to rebuild the class, adopting such methods as would result in the modernising of the engine and bringing it up to such a point that it would be capable of handling almost any passenger train figuring in the company's schedules. The figures representing the tractive force of the engine as originally built and after conversion show clearly the advance that has been made, and, further, when the converted engine is compared with the "Atlantic" type in the same respect, it is seen how nearly the two more modern classifications approximate to one another. As the "Atlantics" have so abundantly proved their worth in handling the heavy express trains, every confidence may be placed in the ability of the rebuilt 4–4–0 type to follow suit.

It will be observed that standardisation has not been lost sight of in the rebuilt locomotives—now classified as "B 4 x"—practically all the important parts conforming to standards already in existence. The boiler is precisely of the same design as those applied to the 2–6–0 type goods engines which, Colonel Billinton informs us, are proving to be the most satisfactory freight locomotives on the line, taking loads up to 1,000 tons.

The first rebuilt engine, No. 55, is now undergoing its trials, and it is anticipated that not only will it handle the heavy express trains with one or two stops without loss of time, but also, if necessary, be capable of use on 75 per cent., if not more, of first-class expresses.

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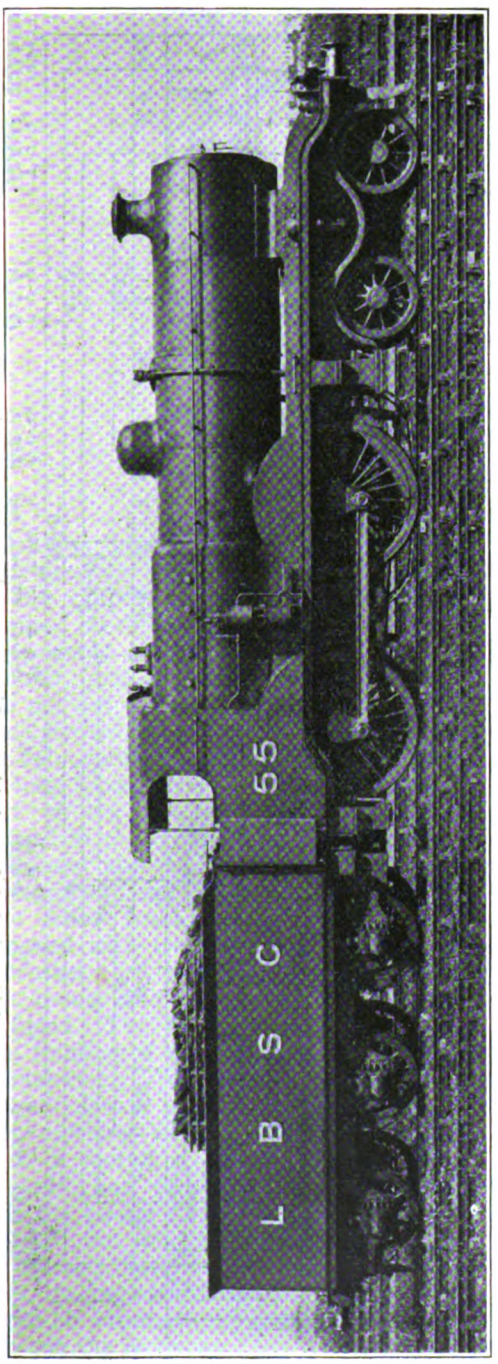

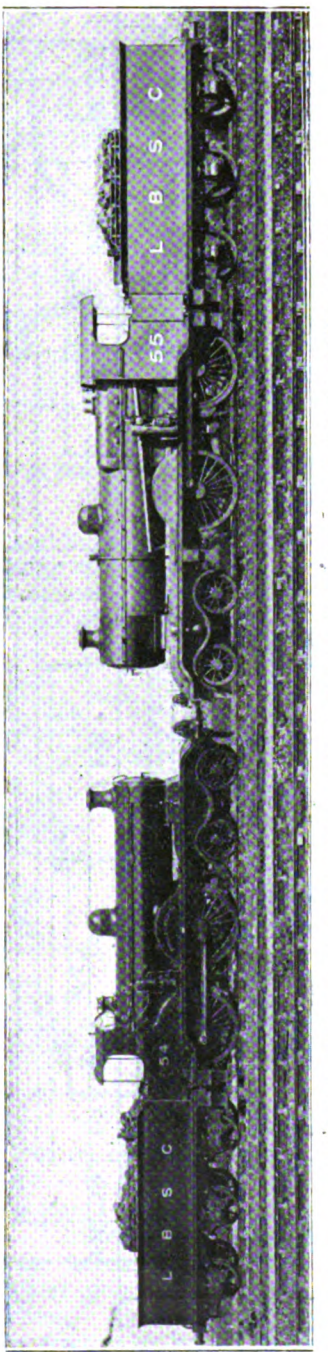

LONDON, BRIGHTON & SOUTH COAST RAILWAY REBUILT 4-4-0 LOCOMOTIVE No. 55.
This engine, rebuilt by Col. L. B. Billinton, with superheater boiler, Belpaire firebox, top feed, &c., was originally of the class represented by No. 54, in the lower illustration.

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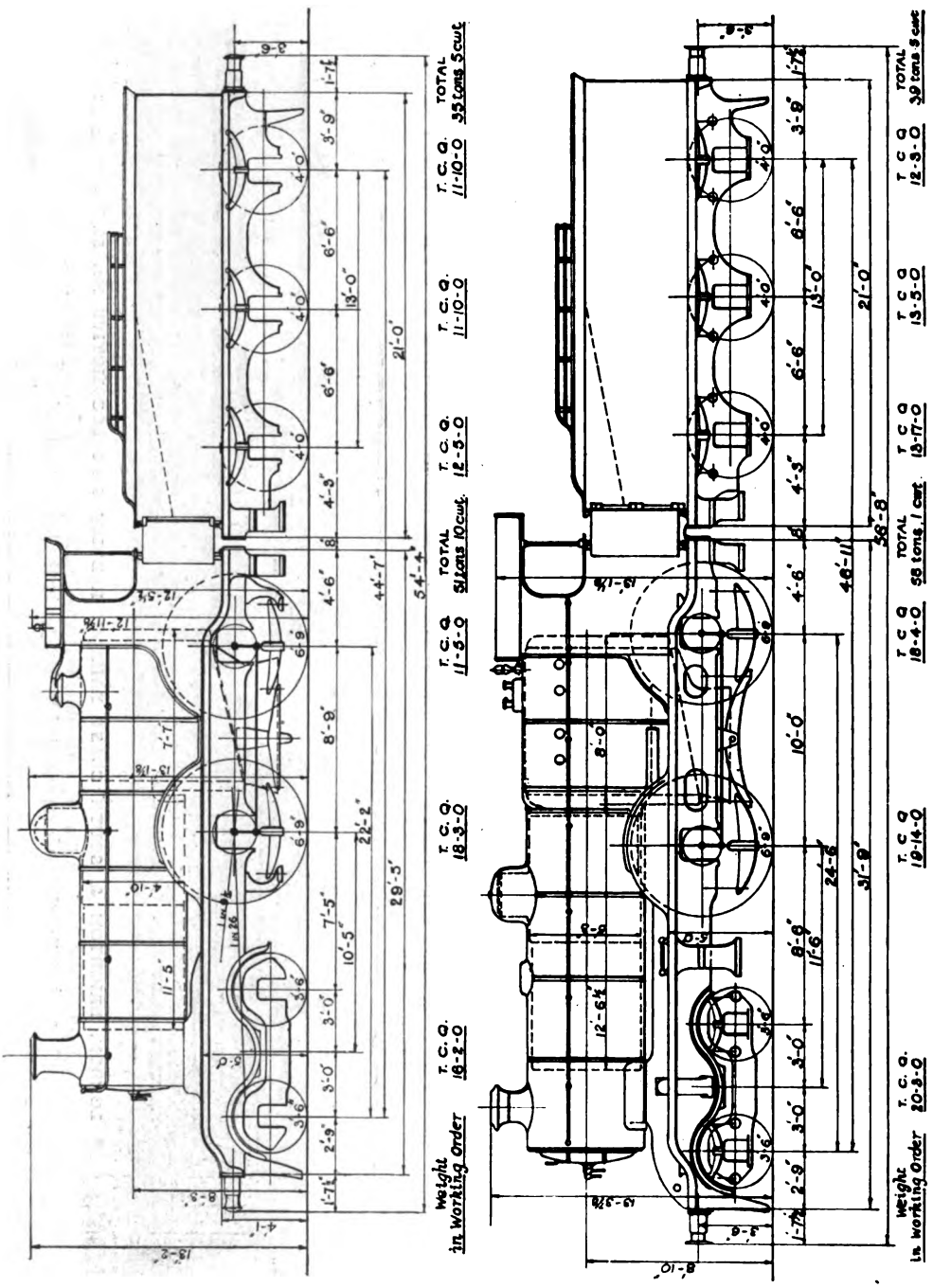
Weight in Working Order
T. C. G. 18-2-0
T. C. G. 18-3-0
T. C. G. 11-5-0
TOTAL 31 tons 10 cwt.
T. C. G. 12-5-0
T. C. G. 11-10-0
TOTAL 35 tons 5 cwt.
Weight in Working Order
T. C. G. 20-3-0
T. C. G. 19-14-0
T. C. G. 18-4-0
TOTAL 38 tons 1 cwt.
T. C. G. 13-17-0
T. C. G. 13-5-0
T. C. G. 12-3-0
TOTAL 30 tons 5 cwt.

DIMENSIONED DIAGRAMS, BEFORE AND AFTER REBUILDING.

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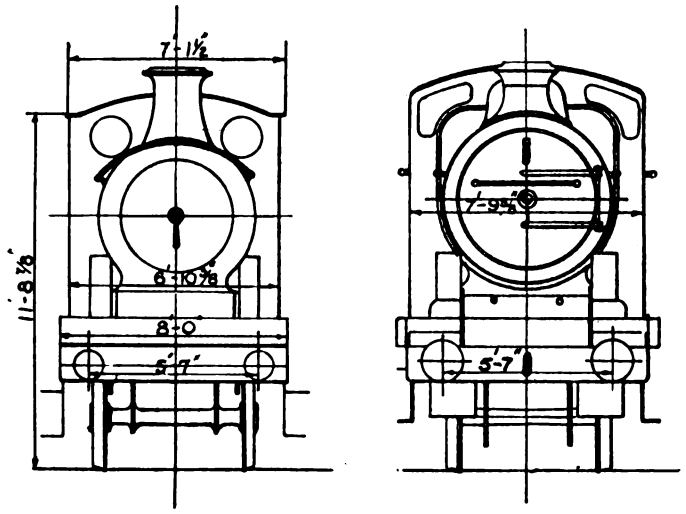

FRONT END VIEWS, BEFORE AND AFTER REBUILDING.

Another interesting point in connection with the rebuilding of this engine relates to the cylinders. It was found that a number of the cylinders of the "B 4" class would require replacement sooner or later, and a new design of cylinders was got out, having piston valves on the same centres as the original "D" valves, the valve motion remaining as in the older pattern locomotive, so that the greater part of the original motion could be utilised in the rebuilding process. Every endeavour was made to keep the exhaust passages as large as possible, in order to give more freedom, the valves being designed with two ports to give double admission.

A roomy and convenient type of cab is fitted. The footplate consists of an iron framing of what may be termed the "honeycomb" pattern, a hardened wood plug of square section being inserted in each opening of the framework. This class of footplate covering gives a firm foothold, and owing to its construction it is the easiest matter possible to renew any of the wooden plugs which may get burned or otherwise damaged, whilst after hosing the footplate the water drains off automatically along the channels between the sections.

The tender of the original engine had a water capacity of 3,000 gallons and a fuel capacity of 4 tons. In the rebuilt tender the water capacity has been increased to 3,600 gallons, the coal capacity remaining as before.

The following are the leading particulars before and after rebuilding :—

	"B 4" Class.	"B 4/x" Class.
Cylinders, diam. ..	19 in.	20 in.
Piston stroke ..	26 in.	26 in.
Coupled wheels, diam.	6 ft. 9 in.	6 ft. 9 in.
Wheelbase, rigid ..	8 ft. 9 in.	10 ft.
Wheelbase, total ..	22 ft. 2 in.	24 ft. 6 in.
Boiler, diam. outside	4 ft. 10 in.	5 ft. 3 in.
Boiler, length of barrel	11 ft. 5 in.	12 ft. 6¼ in.
Boiler, height of centre	8 ft. 3 in.	8 ft. 10 in.
Heating surface—		
315 tubes, 1⅞ diam.	1,507 sq. ft.	110 at 2¼ diam. 21 at 5½—1,155·4 sq. ft.
Firebox	120 sq. ft.	139 sq. ft.
Total	1,627 sq. ft.	1,294.4 sq. ft.
Superheater surface.	—	21 elements, 279 sq. ft.
Grate area ..	23.75 sq. ft.	24.8 sq. ft.
Boiler pressure ..	180 lb. per sq. in.	180 lb. per sq. in.
Weight, adhesion ..	35 tons 8 cwt.	37 tons 18 cwt.
Weight, engine, total	51 tons 10 cwt.	58 tons 1 cwt.
Weight, engine and tender in working order	86 tons 15 cwt.	97 tons 6 cwt.
Tractive force, 85 per cent. b.p. ..	17,700	19,645
Ad. factor	4.47	4.32

It will be noticed that the new boiler is fitted with a Belpaire firebox in place of the round-topped one of the original class. Further, it has a top feed device and an extended smokebox. A Weir feed-water pump also forms part of the equipment. As the illustrations show, the locomotive as rebuilt is of handsome appearance, and whilst obviously conforming to more modern standards, is nevertheless symmetrically proportioned and well turned out in every respect.

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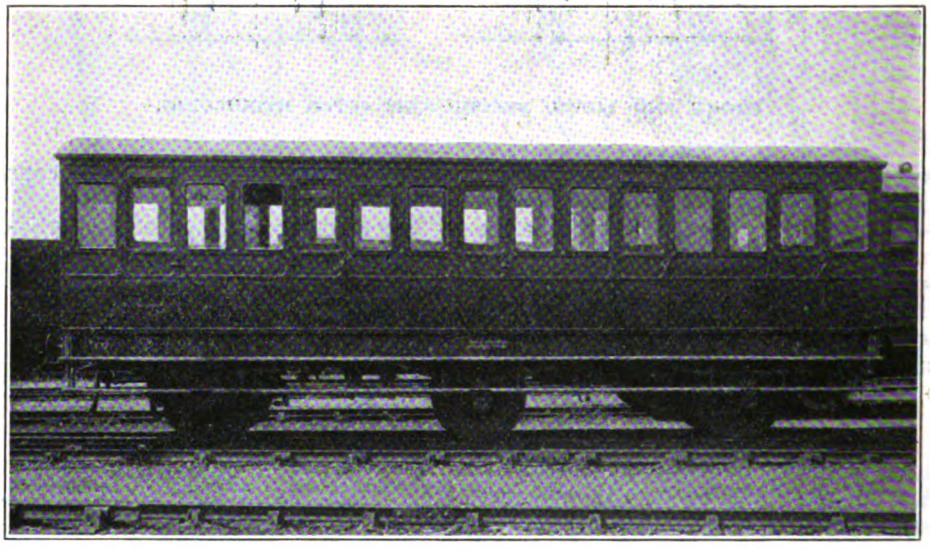
Uses of Old Railway Coaches.

By FRANK GILBERT.

THERE is a story told of an American visitor to these shores who, displeased with certain English methods of transportation, cynically declared that the only passenger rolling-stock which had ever been withdrawn from service since the days of Stephenson was a solitary coach exhibited on the concourse of Waterloo station.

This criticism was, however, as most readers of the RAILWAY MAGAZINE would readily admit, not only harsh but unjust. The rolling-stock working in British railway services to-day is not only of a very high standard of comfort and craftsmanship, but it compares very favourably with the passenger vehicles of other countries. It must be obvious to anyone giving the matter a moment's thought that some organisation must exist to pick out certain old coaches and wagons to make room for the new stock which is continually under construction in the shops of the railway companies and firms which specialise in this class of manufacture. With the progress which is constantly being made to produce better vehicles, and as lessons are yearly being learned from that best teacher of all—experience—a number of coaches (variable according to conditions prevailing on the line concerned) are annually marked down as unsuitable for modern traffic.

The writer has been privileged to study the methods adopted by the London & South Western Railway for dealing with the disposal of vehicles which can no longer be usefully used in either main or branch-line services. This question is admittedly an old one, but it is doubtful if it has ever been done justice to by writers on railway topics in the past. The tendency has rather been to write enthusiastically of any new type of vehicle which has been introduced for some particular traffic, and the story of what happens to the old coaches has not perhaps appealed to the experts. Yet there is a very real story in these old rejected coaches, and although the sight of them taken from their under-carriages and adapted for use as platelayers' cabins and engineer's department stores is perhaps a familiar one on certain



OLD LONDON AND SOUTH WESTERN RAILWAY COACH READY FOR SALE.
On the under-carriage is painted the order, "Return underframe to Eastleigh."

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lines, only a very small proportion of their number can be utilised by the companies in this fashion.

To anyone with imagination a great wealth of romance centres around an old coach. Since the day when, resplendent in its bright new paint and upholstery, it emerged from the shops to make its first trip, it has carried a multitude of all sorts and conditions of men—lovers, business people, race-goers, soldiers and sailors have been carried; possibly some of that famous phantom army of Russians was borne by it in 1914—and for thirty or forty years, according to its type and use, it has served its masters well. Possibly the men who designed and built it are no more, but even now its work is not ended. Destiny has further need for it still.

Passengers on the London & South Western Railway between Waterloo and Southampton must have noticed in the big sidings cut out of chalk at Micheldever station—between Basingstoke and Winchester—many hundreds of coaches, and possibly they have been puzzled to find the reason why these vehicles should not be usefully employed. Such questioners may, however, rest assured that the vehicles have been sent to Micheldever sidings only after very careful examination and full consideration of all the facts and possibilities.

The carriage and wagon department of the London & South Western Railway is a very alive department, and its chief, Mr. Surrey Warner, O.B.E., is a man of great experience and technical knowledge. Under his control is a section which is charged with the work of periodically examining every passenger and goods vehicle owned by the company, and when from reasons of public safety, economy or general policy it is determined that a vehicle should no longer be used in traffic, it is labelled to Micheldever and its history sheet marked accordingly.

AN OLD RAILWAY WAGON IN USE AS A BUTCHER'S SHOP AT BYFLEET, SURREY.

From now onwards the publicity department of the company takes a hand. Co-operating harmoniously, carriage and wagon and publicity departments set to work to offer these rejected coaches for sale to the general public. The coach bodies being no longer of use to the company, a price is set upon them. From time to time, and governed by the demand, a batch of these coaches is worked from Micheldever sidings to the carriage and wagon shops at Eastleigh. Here a special staff gets busy making them ready for sale. All the gas fittings and ventilators and other accessories which can be advan-

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L. & S.W.R. COACH USED AS OFFICERS' QUARTERS DURING THE GREAT WAR.

tageously used in new and renovated stock are removed. The holes in the roof where the gas burners or ventilators were originally fixed are covered up and the coach is then given a coat of paint.

Intending purchasers who are attracted by the extremely moderate price of £20 for a passenger coach of five compartments, or £10 for a covered goods wagon, are given an opportunity of inspecting the vehicles previous to deciding to buy, and when an order is definitely given the traffic department arranges to work the coach to the destination station desired. The charge of £20 includes delivery free on rail to any of the company's stations, and on arrival there the new owner is responsible for removing the body from the undercarriage and transferring the body at his own expense to its new resting place.

The first task is made easy by the fact that the bolts fastening the body and undercarriage together are always loosened before the vehicle leaves Eastleigh. The work of moving the body from the station is, similarly, not difficult, nor should it be costly. With the aid of a lorry, rollers, and a crowbar or two, a couple of men can easily carry this out, and when at last the load is complete, the undercarriage is sent back by the station-master to the carriage and wagon department. This undercarriage is, of course, the most valuable part of a coach, and it can almost always be used again after alteration and renovation.

The lorry leaves the station with the body and proceeds to the spot where it is desired to give the old coach a new lease of life. If the new owner is wise, he will have previously prepared the site. A very good and generally adopted method is to lay short brick foundations and to lower the body on these piers, thus raising it above the ground, and is but a few minutes' work.

There is no limitation to the uses of these old coaches. They can be used for a club house, dressing-room for football, hockey, cricket, tennis or athletic club, summer house, tool shed, store, gamekeeper's hut, or even for a bungalow or shop. On another page there appears a photograph of an old railway goods wagon which has been successfully converted into a butcher's shop, which is located on the Chertsey Road, near Byfleet, Surrey. Doubtless readers of this article know of many similar instances in which old coaches are employed. Admittedly there are drawbacks to the idea, but many cases have been brought to the writer's notice where extremely comfortable bungalows for week-end and holiday use have been contrived from old coaches.

The type of coach which the London & South Western Railway Company is selling at £20 has five compartments and the dimensions are as follows:—30 ft. over body, 7 ft. inside height, 7 ft. 4½ in. outside height, 8 ft. 0¾ in. wide, with five compartments each 5 ft. 10 in. long. By sawing out two partitions, two rooms, 11 ft. 6 in. by 8 ft., and one room, 5 ft. 10 in.

ANOTHER VIEW OF L. & S.W.R. COACH USED AS OFFICERS' QUARTERS DURING THE GREAT WAR.

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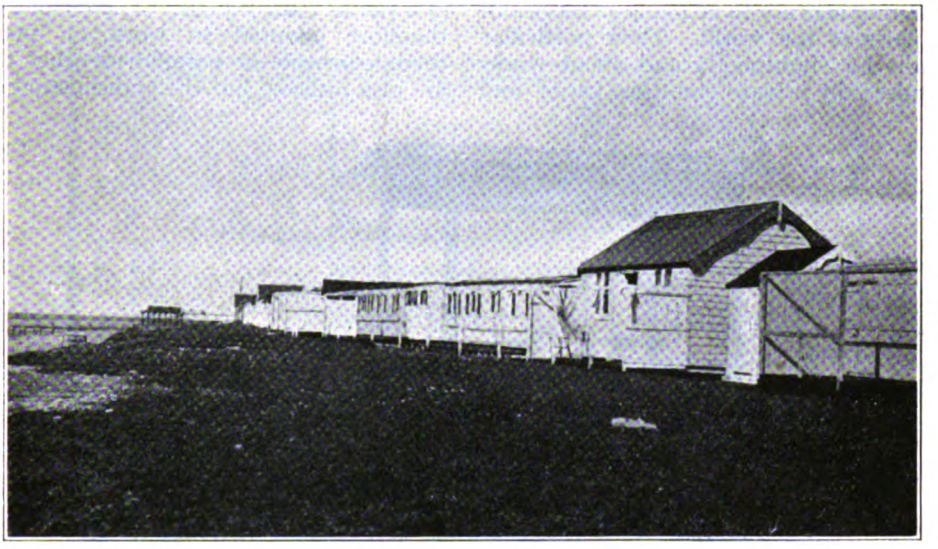
by 8 ft., results. An artistic verandah may be constructed at little cost, and, set amid suitable rural or seaside surroundings, a very pleasant little abode for a bachelor or happy couple is contrived at a surprisingly low cost. The coach is watertight when sold, so a moderate expenditure on decoration and furnishing is all that is required.

food and water. By the way, a good water supply is of vital importance to the coach dweller, so special care should be taken to choose the site with an eye to this point.

An even more elaborate building can be made by using three coach bodies, and in this manner several really large rooms may be arranged.

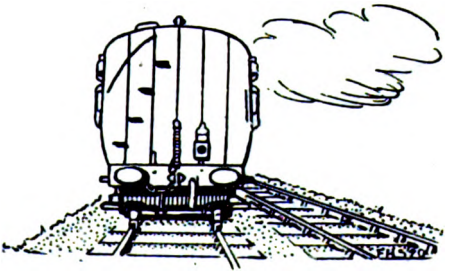


Photo] [*J. F. Gairns.*

OLD RAILWAY CARRIAGES AS SEASIDE BUNGALOWS FIGURE PROMINENTLY ON THE BEACH AT HUNSTANTON, NORFOLK.

For a larger residence two coaches may be set side by side and the intervening passage roofed. In this way two bedrooms, a sitting room and a kitchen, each 11 ft. 6 in. by 8 ft., will be created, and, in addition, two spare rooms each 5 ft. 10 in. by 8 ft. One of these small rooms can be used as a dressing or lumber room and the other for the storage of

A home in an old coach is not to everyone's taste, of course, but it has many good points, not the least of which is that its owner can be more or less independent. Given an ingenious man and an old railway coach, there is no limit to the comfortable, useful and inexpensive dwellings which may be planned.



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Petrol Locomotives for Standard and Narrow Gauge Railways.

ALTHOUGH the internal-combustion locomotive for heavy main line traffic has not yet found its way into standard practice, light types have become fully established, and large numbers are to be found in service in all parts of the world. Their particular field is for shunting in and about works premises, in private shunting yards, and to some extent for dealing with standard railway wagons, though usually in sidings of firms who receive and consign traffic directly from or to the main line railways; for conveying material and plant and sometimes men engaged on large engineering undertakings, such as docks, harbours, waterworks, &c.; on plantations, and for estate use; and here and there in the yards or about the works of railway companies.

For the smaller types the engines correspond approximately with road motor car practice, except that they are usually more substantial and designed for heavy service in proportion to the size and capacity, and are expected to be able to withstand shocks and relatively rough usage to an extent which is not expected of a motor road vehicle. The engines are therefore adapted to work on petrol, though benzole or paraffin or other fuels are also utilised, but the transmission and gearing, together with the clutch and control devices, are designed to suit conditions found on the railways upon which they are to work, including frequently light and relatively roughly laid tracks, or, where the lines are of more substantial character, to be able to stand the shocks of shunting standard main line wagons and to move on occasion proportionately heavy loads.

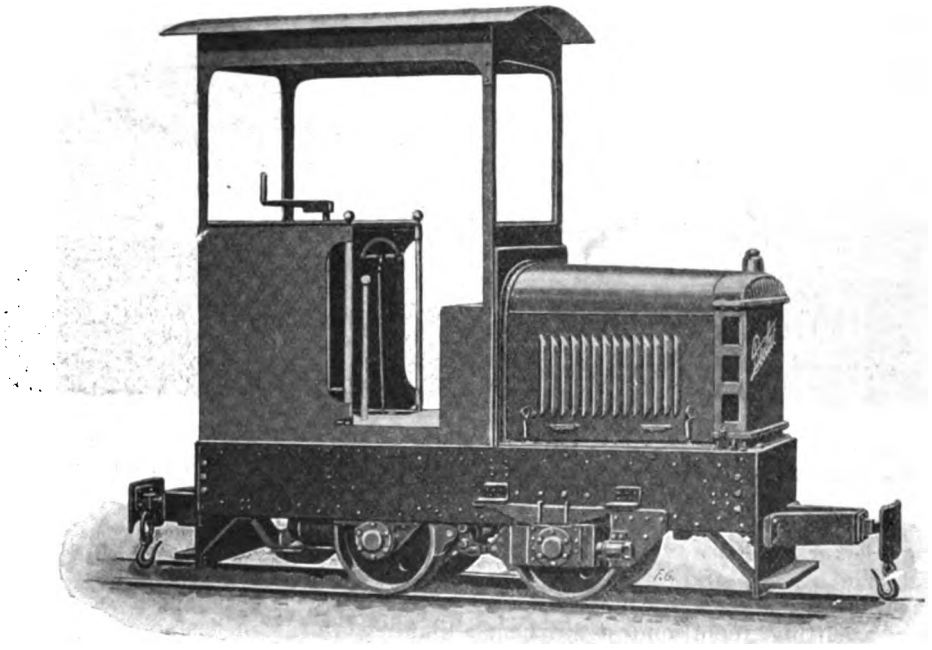

FIG. 1.—"BERLIET" PETROL LOCOMOTIVE (3-TON MODEL), 2-FT. GAUGE.

Many users of narrow-gauge track have replaced horse haulage by steam, only to find that although this change has contributed towards a general speeding up,

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there are several factors which mitigate against its entirely satisfactory operation. The chief points against the use of the small steam engine are that it is necessary to refill the boiler frequently, which risk of explosion and a liability to Boiler Inspection Acts. The steam engine consumes fuel whether it is standing-by or running with a load. A skilled driver, and sometimes a fireman, is necessary.

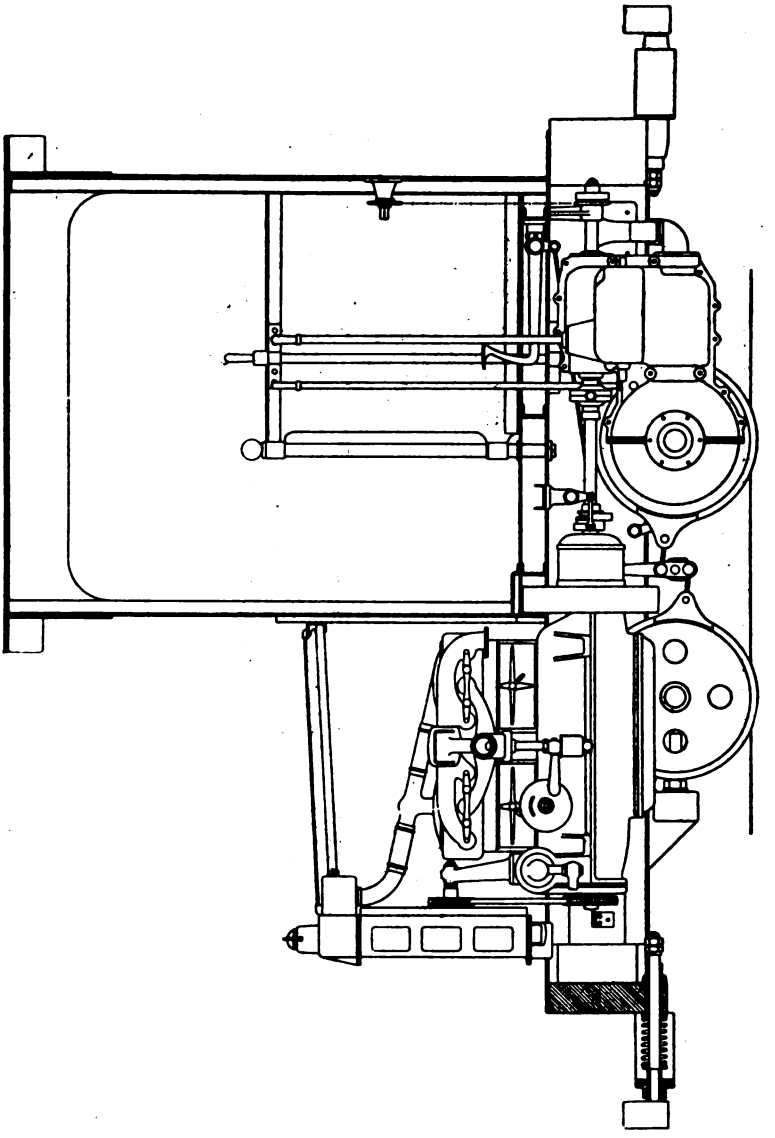

FIG. 2.—LINE DIAGRAM OF "BERLIET" PETROL LOCOMOTIVE (3-TON MODEL), 2-FT. GAUGE.

generally means a run to a point some distance from the scene of its activities. Again, a certain amount of time is required to get up steam prior to commencing work, and further time required at night for raking out the fire, &c. Owing to the small size of the boiler there is always a The fuel, *i.e.*, coal or wood, cannot always be easily obtained and then often at an inflated price.

On the other hand, the petrol-driven locomotive, while providing the necessary speeding-up, has many advantages over its steam-propelled rival, which advantages

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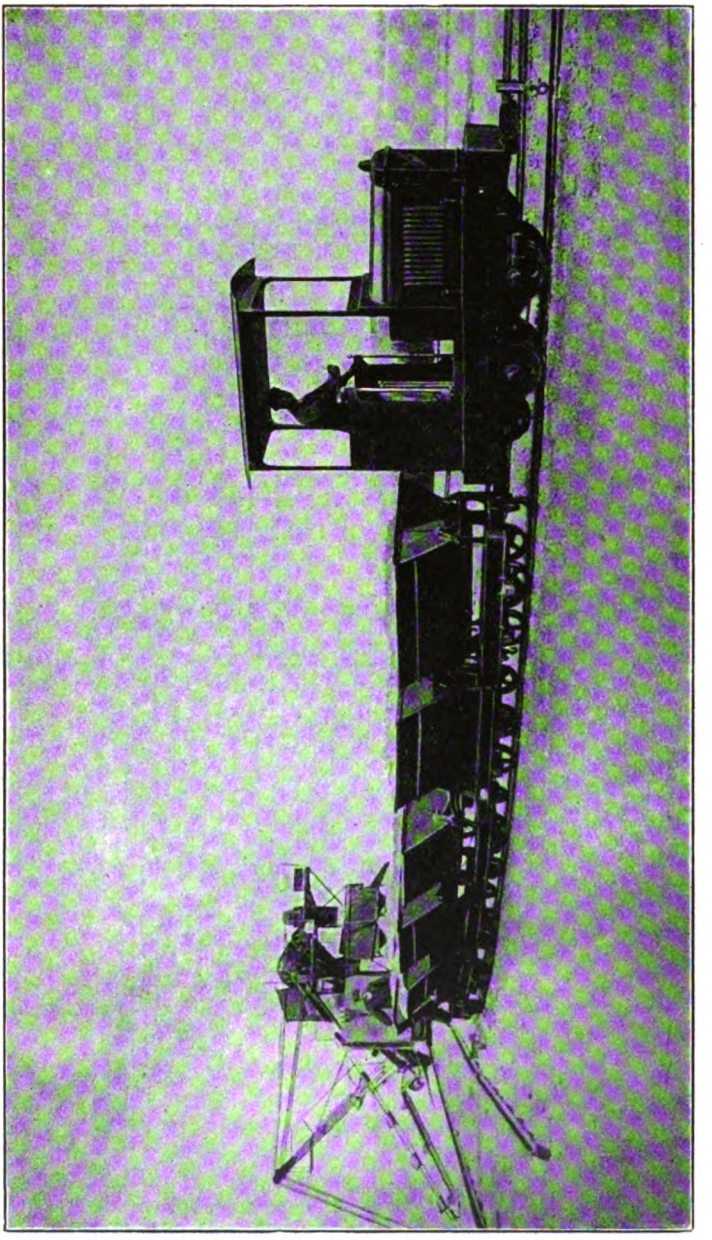

FIG. 3.—"BERLIET" 3-TON PETROL LOCOMOTIVE ON 2-FT. GAUGE LINES, SERVING EXCAVATING PLANT.

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can be briefly summed up as follows: no boiler, with its risk of explosion, constant filling-up, and necessary inspection; always ready for use, no time being required to get up steam; when not actually hauling loads the engine can be stopped and thus no fuel is consumed; can be operated by one man, who merely requires a few hours' tuition to become thoroughly capable of taking control; burns liquid fuel—petrol or benzole—which is usually easily and cheaply obtainable. In addition, there is a complete absence of sparks ashes or smoke, thereby doing away with the risk of fire when operated inside buildings, making it very suitable for use where a large portion of the track is under cover. Again, the petrol locomotive is low in both first cost and upkeep expenses, the latter item being much lower than for a steam engine.

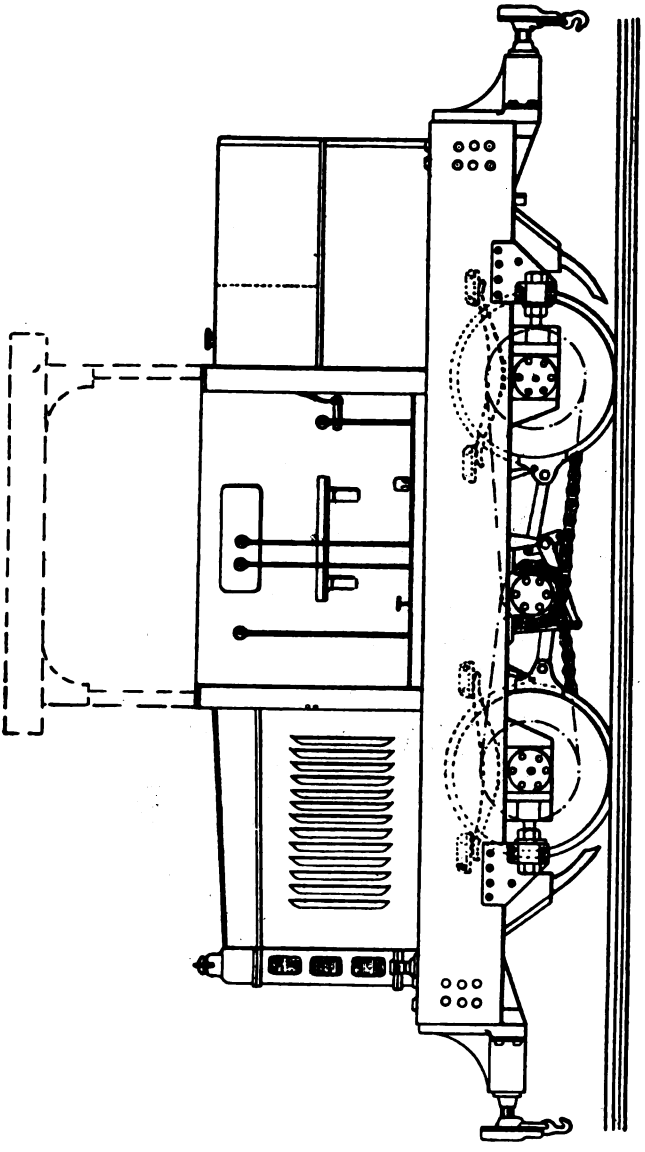

FIG. 4.—"BERLIET" PETROL LOCOMOTIVE (4-TON MODEL), 2-FT. GAUGE.

In the field of internal-combustion practice applied for track purposes the Berliet productions of the Anglo-French firm known as Automobiles M. Berliet, of Lyons, Paris and London (40, Sackville Street, W. 1), have attained a deservedly high reputation. Many hundreds of this firm's petrol locomotives are in use all over the world, while large numbers were employed on the light railways of which so great a mileage was constructed and operated during the Great War on all fronts. Speaking generally, there are two standard models for use on the 2-ft. gauge, the 3-ton as used in quarries and factories, and having a wheelbase of only 32½ in., thus enabling it to be transferred from one line to another by means of turntables so largely used for light narrow-gauge wagons, and the 4-ton model intended for heavier duties.

A third model is designed for working on standard 4 ft. 8½ in. gauge lines. The majority of large works now have their own private sidings on which the trucks and wagons containing goods and supplies are made up ready for the railway companies to take away. This means that there is always a certain amount of shunting to be done, for which a steam locomotive is usually employed. This has, however, proved too expensive, for unless the

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locomotive can be fully employed the whole of its time, a considerable amount of fuel, not to mention the driver's and fireman's time, is wasted while standing about during loading and unloading periods. The petrol locomotive does away with this waste period, for when not actually required for haulage purposes, the engine can be stopped, and, when required, can be instantly started up. Again only one man is necessary to drive it, and anybody can take charge of the machine after only a few hours' training.

There being no smoke, sparks &c., the locomotive can be used with impunity inside buildings, there being no risk whatsoever of fire. This is a very desirable point for manufacturers, whose lines often run through buildings. In addition to its usefulness to the owners of large works, another sphere of activity can be found for the petrol locomotive, for 4 ft. 8½ in. gauge, by railway companies. It can be used as a shunting engine in large goods yards and can replace a steam locomotive. Its economical operation both from the point of view of first cost and maintenance and its general handiness are two strong points in its favour. It can also be used with success on small branch lines where the volume of traffic is so light that to run a steam engine would be unprofitable.

This type has been adopted for yard shunting purposes by several of the leading French railways, and also certain lines in other countries.

Fig. 1 illustrates the 3-ton model as used on 2ft. gauge lines, while Fig. 2 is a line drawing showing the general features. It is a 4-wheel type, the wheelbase, as already mentioned, being 32½ in. only, and the front axle, which is immediately under the motor, is suspended by elliptic springs inside the frame members, the rear axle

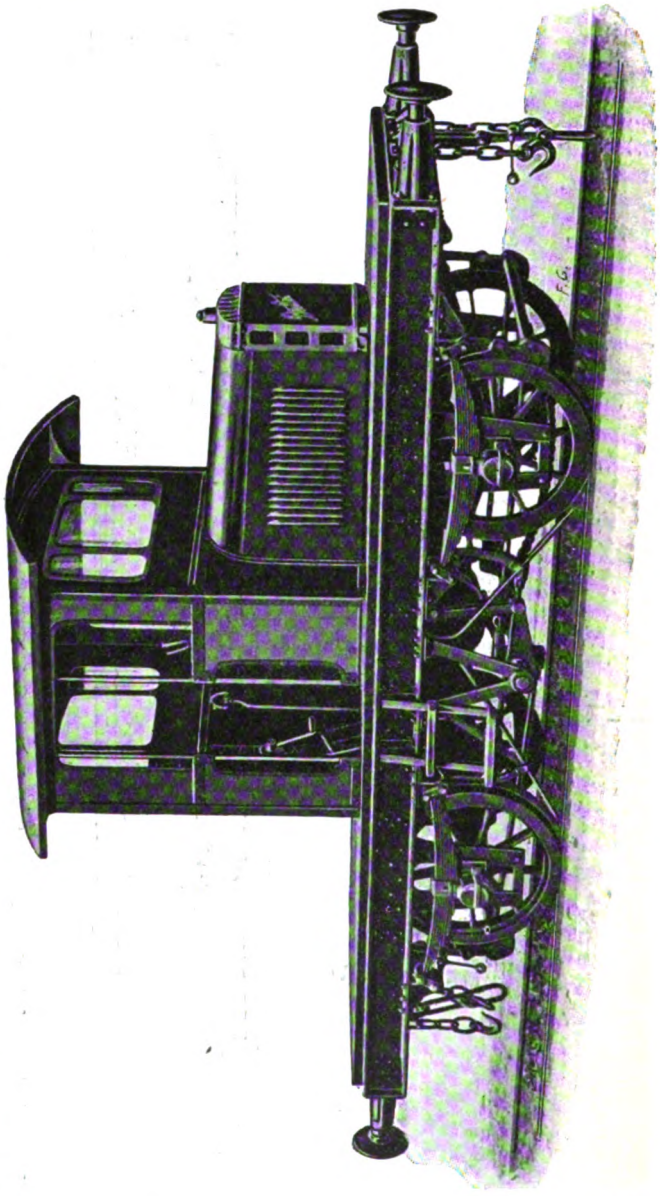

FIG. 5.—"BERLIET" PETROL LOCOMOTIVE FOR USE ON STANDARD GAUGE LINES.

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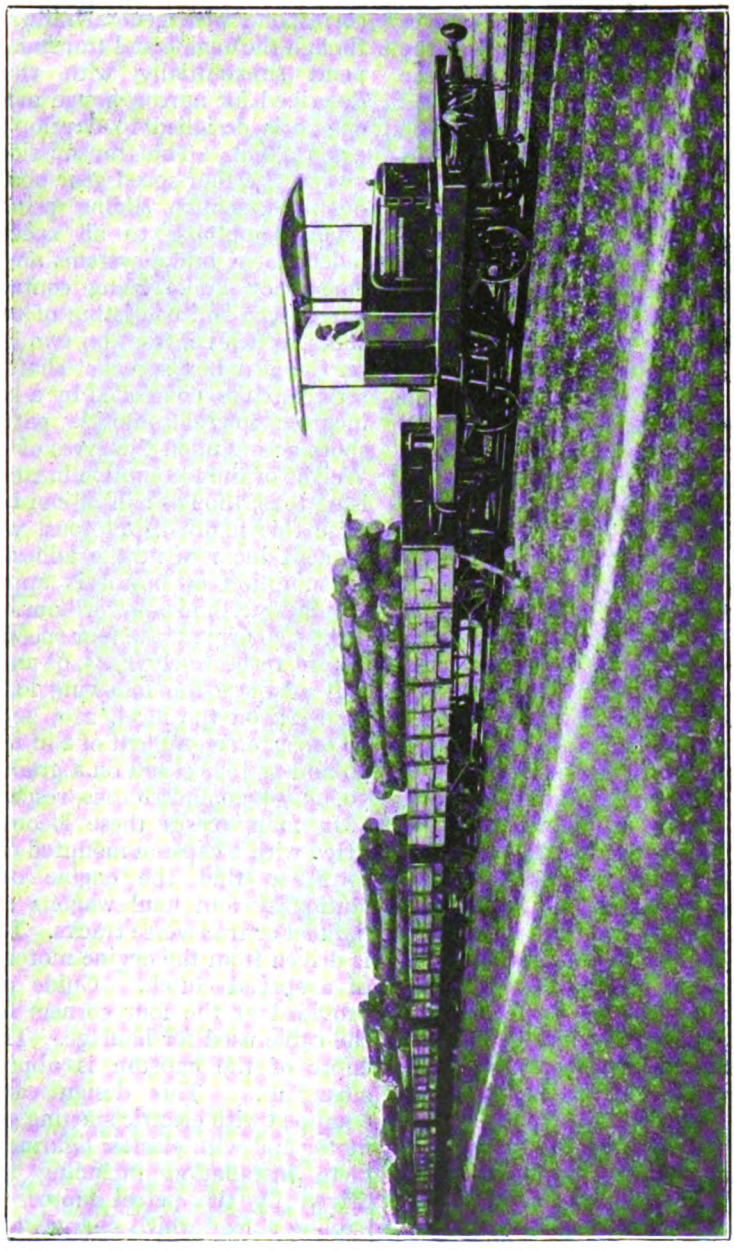

FIG. 6.—"BERLIET" PETROL LOCOMOTIVE, HAULING TIMBER ON STANDARD GAUGE LINES.

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being rigidly attached to the frame. A combined spring buffer and coupling are provided at each end. The motor has four cylinders cast in pairs, with a bore of 110 mm. and a stroke of 140 mm., the rating being 30 h.p. Inlet and exhaust valves are interchangeable and are located on the left side of the engine and operated by the same camshaft. A large radiator and centrifugal pump, with an engine-driven fan to assist the draught, are provided for cooling. The Berliet carburettor has a hot and cold air attachment. The governor limits the speed of the motor to 1,200 r.p.m. Ignition is by high tension magneto, and the engine is designed to operate on either petrol or benzole, without special adjustment. The clutch is of the multiple plate type, controlled by a foot pedal, while the transmission provides for three speeds, both forward and reverse. The gear box drives directly on to the rear axle, but chain sprockets and roller chains enable both axles to be utilised for driving. The general speed and reversing motions are controlled by hand levers mounted in the driver's cab. All wheels are braked. The petrol tank is placed inside the cab and feeds the carburettor by gravity. It holds sufficient fuel for some twenty hours' running.

Weight in working order is 3 tons. The three speeds provided for are 4½, 7½ and 13½ m.p.h., and the corresponding loads that can be hauled at each are 75, 48 and 26 tons on the level; 37, 24 and 13 tons on a gradient of 1 in 100; and 19, 12 and 6 tons on a gradient of 1 in 33. The locomotive is supplied complete with acetylene lighting, consisting of two head lamps and a generator. Fig. 3 is a view showing one of these locomotives serving an excavating machine.

Fig. 4 is a line diagram showing the 4-ton. model, also adapted for use on 2-ft. gauge lines. In this case, both axles are spring supported. In general, the design corresponds with that of the 3-ton model, but the motor is designed for a normal speed of 1,400 r.p.m. The gear-box and transmission are modified somewhat in view of the additional power to be applied. Weight in working order is 4 tons, and the three speeds provided are, respectively, 3, 5 and 9 m.p.h. At these speeds the loads that can be hauled on the level are, respectively, 60, 50 and 40 tons, and on gradients of 1 in 100, 38, 26 and 9 tons.

Fig. 5 illustrates the type provided for use on standard gauge railways. In this case, wheels, axles, springs and couplings correspond with general railway practice, though the engine and transmission correspond substantially with that already described for narrow-gauge models. The engine is designed to develop 33 h.p. at 1,300 r.p.m. The transmission includes, however, a four-speed gear box, operating on the selective sliding principle, with reverse applying to all speeds. Two independent brake systems are fitted, the emergency brake being controlled by a hand lever and consisting of two pairs of shoes, which contract on two large drums on the gear box sprocket shaft, while the service brake, controlled by a hand wheel, includes four locomotive pattern brake shoes acting upon the tyres of the wheels. Weight of the locomotive in running order is 9½ tons, though ballast can be added to raise this figure to 15 tons, with a consequent increase in the adhesion. Fuel consumption of petrol is approximately .7 pints per horse-power hour.

At 1,400 r.p.m. the four speeds provided for are, respectively, 2, 4½, 9½ and 16 m.p.h. and at these the following loads can be hauled: on the level, 220, 220, 100 and 60 tons; on a gradient of 1 in 100, 150, 80, 30 and 15 tons; and on a gradient of 1 in 50, 95, 50, 20 and 10 tons, respectively.

In many cases these locomotives are fitted with a capstan mounted on the platform, so that the engine can remain stationary and haul wagons situated at parallel or transverse tracks. The capstan is driven from the engine motor by means of a special clutch. Guide pulleys are provided at the four corners for guiding the cable used for haulage. The tractive effort of the capstan is approximately, 2,652 lb. This design can also be equipped with electric starting gear for the motor and with electric lighting, the complete installation including a dynamo driven by the petrol motor, when not hauling a load, which charges an accumulator for supplying current as required.

Fig. 6 illustrates no fewer than five bogie wagons loaded with rough timber being hauled over a standard gauge railway by a "Berliet" petrol locomotive.

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THE RAILWAY PORTRAIT GALLERY.

SIR HENRY THORNTON, K.B.E.,

Chairman and President, Canadian National Railways.
General Manager, Great Eastern Railway, 1914–1922.

MAJOR-GENERAL Sir Henry Worth Thornton, K.B.E., appointed Chairman and President of the Canadian National Railways—over 22,000 miles of line operated on behalf of the Canadian Government and including the Inter-Colonial, National Trans-Continental, Canadian Northern, Grand Trunk Pacific and Grand Trunk Railways, all now taken over by the Dominion Government—has been General Manager, Great Eastern Railway, since April 1914. Previously he had been General Superintendent of the Long Island Division of the Pennsylvania Railway, U.S.A. On the Great Eastern Railway he has "made good" in every way, and has come to be regarded as the friend and mentor of every member of the staff, from the highest to the lowest. During the war he rendered special services, not only as a member of the Railway Executive Committee, but also as Deputy Director-General of Movements and Railways and as Director of Railway Transport in France, in recognition of which he was created a Knight Commander of the British Empire.

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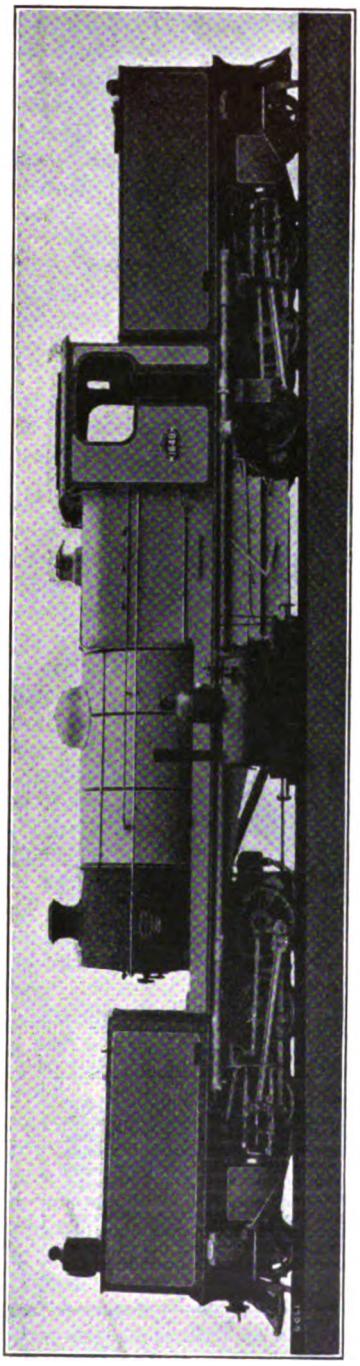
Articulated Locomotives in South Africa.



LATEST TYPE OF "GARRATT" LOCOMOTIVE (2-6-6-2 TYPE), SOUTH AFRICAN RAILWAYS.
Weight in working order, 133·75 tons.

FOR many years Mallet articulated locomotives have been used on the severely graded routes of the South African Government Railways, but it was not until 1920 that the "Garratt" type was also introduced. Five locomotives were then delivered by Beyer, Peacock & Co., Limited. They included three different designs, namely, a 2-ft. gauge (three engines), and the other two for the 3-ft. 6-in. gauge, one being a light type for a 45-lb. rail, and the other a heavy main line engine. The 2-ft. gauge engines were the first to be put into service, then came the main line "Garratt" in January, 1921, followed by the light type 3-ft. 6-in. gauge engine four months afterwards. By ordering three different sizes of engines the "Garratt" principle can be studied under three sets of conditions, and thus materially assisted towards a more reliable appreciation of their worth.

The South African Railways possess some of the heaviest locomotives in the world. In 1909 the first articulated Mallet engine was introduced and 80 engines of this type have since been put in service. There have also been two experimental Mallets, one having four high-pressure cylinders, and the other wheels of smaller diameter for the high-pressure engine, with a view to obtaining a better supply of steam to the low-pressure cylinders.

The heavy main line "Garratt," classified GA, is an experimental engine in the fullest sense, being some 40 tons heavier than any previous "Garratt" engine constructed. It therefore represents the highest tractive power locomotive of the "Garratt" patent design yet built and put in service.

Two of the 2-ft. gauge "Garratt" engines have been employed on the Stuartstown branch in Natal, where the ruling gradient is 1 in 33 compensated, the sharpest curve 175 ft. radius, and the weight of rail used 35 lb. to the yard. Prior to the advent of the "Garratt," side tank engines weighing 30 tons were in use.

The light type 3-ft. 6-in. gauge locomotive, classified as class GB, has been running passenger trains on the north and south coast lines of Natal. These lines are

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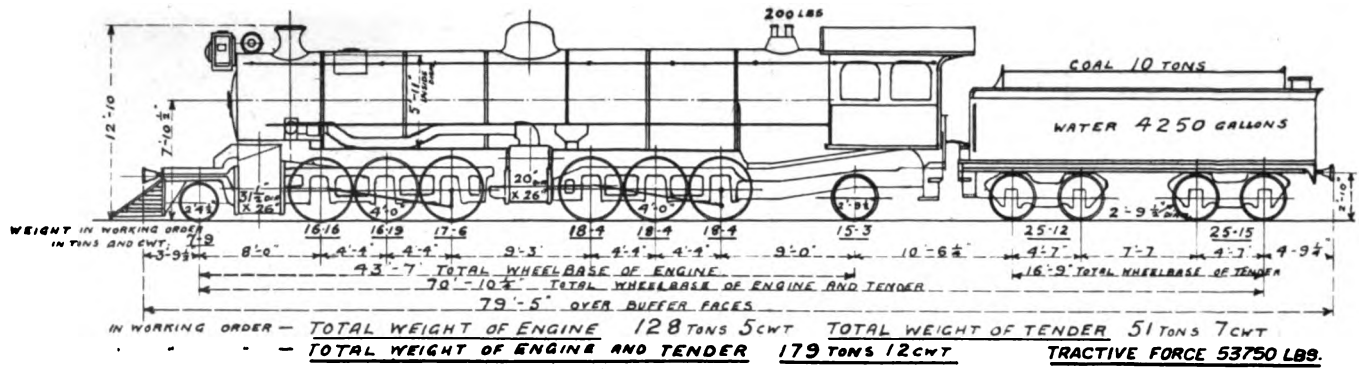
200 LBS
COAL 10 TONS
WATER 4250 GALLONS
WEIGHT IN WORKING ORDER IN TONS AND CWT.
43'-7" TOTAL WHEELBASE OF ENGINE
70'-10½" TOTAL WHEELBASE OF ENGINE AND TENDER
16'-9" TOTAL WHEELBASE OF TENDER
79'-5" OVER BUFFER FACES
IN WORKING ORDER — TOTAL WEIGHT OF ENGINE 128 TONS 5 CWT TOTAL WEIGHT OF TENDER 51 TONS 7 CWT
— TOTAL WEIGHT OF ENGINE AND TENDER 179 TONS 12 CWT
TRACTIVE FORCE 53750 LBS.

DIAGRAM SHOWING LEADING DIMENSIONS OF CLASS MH "MALLET" LOCOMOTIVE, SOUTH AFRICAN RAILWAYS.

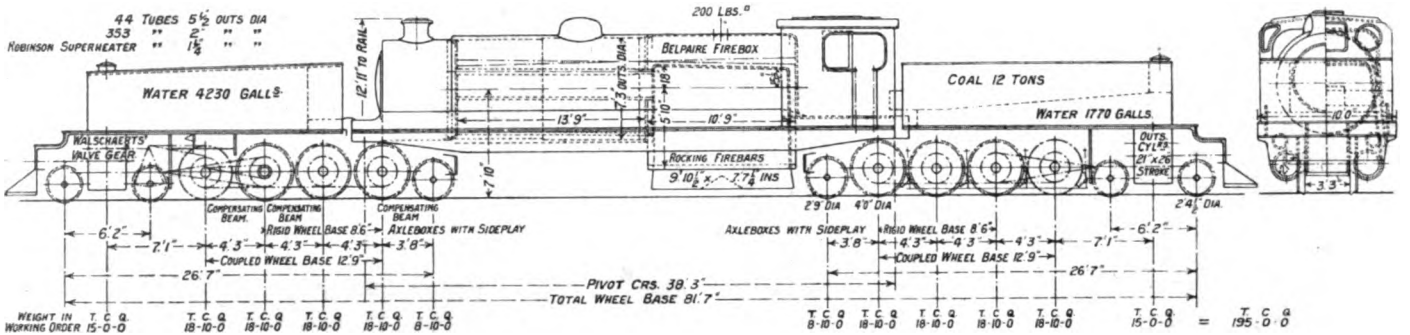
44 TUBES 5½ OUTS DIA
353 " 2" " "
ROBINSON SUPERHEATER " 1⅝ " "
WATER 4230 GALLS
WALSCHAERTS VALVE GEAR
BELPAIRE FIREBOX
ROCKING FIREBARS
COAL 12 TONS
WATER 1770 GALLS
COMPENSATING BEAM
RIGID WHEEL BASE 8'6"
COMPENSATING BEAM
COMPENSATING BEAM
AXLEBOXES WITH SIDEPLAY
COUPLED WHEEL BASE 12'9"
PIVOT CRS. 38'3"
TOTAL WHEEL BASE 81'7"
WEIGHT IN WORKING ORDER 15-0-0 18-10-0 18-10-0 18-10-0 18-10-0 18-10-0 8-10-0 8-10-0 18-10-0 18-10-0 18-10-0 18-10-0 18-10-0 15-0-0 = 195-0-0
HEATING SURFACE TUBES 3468 Sq. Ft.
FIREBOX 278 " "
3746 " "
SUPERHEATER 614 " "
TOTAL 4360 " "
GRATE AREA 75 Sq. FT.
TRACTIVE FORCE AT 75% B.P. 71,660 LBS.
FACTOR OF ADHESION (TANKS FULL) 4·6
TOTAL WATER CAPACITY 6000 GALLONS.

DIAGRAM SHOWING APPROXIMATE LEADING DIMENSIONS OF PROPOSED 4-8-2-2-8-4 "GARRATT" LOCOMOTIVE, SOUTH AFRICAN RAILWAYS.

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laid with 60-lb. rails, and in the case of the south coast line the track is mainly ballasted with sand and cinders. On the north coast line 300 ft. radius curves occur, and the ruling grade is 1 in 30 uncompensated. On the south coast line the curvature is a little less severe, and the heaviest grade is 1 in 30 compensated.

As a result of experience this engine has been placed on the fastest passenger train at present running on the south coast line. Its load on a continuous 1 in 30 grade is 143 tons. The engine on test has done 42 m.p.h., and rides very smoothly at this speed. It has never yet been turned, running chimney first one way and cab first the other.

No trouble has been experienced so far with the high-pressure joints in the "Garratt" type engine, and from indicator diagrams taken on engine 1649 the drop in pressure in the hind engine due to the length of high-pressure main is negligible, as is also the effect of the length of exhaust pipe on the back pressure.

As an example of the potentialities of the "Garratt" type of locomotive a 71,000 tractive effort engine suggested for service on the South African Railways has been designed. This is illustrated in outline.

HAMILTON RAILWAY BRIDGE, NEW ZEALAND GOVERNMENT RAILWAYS.

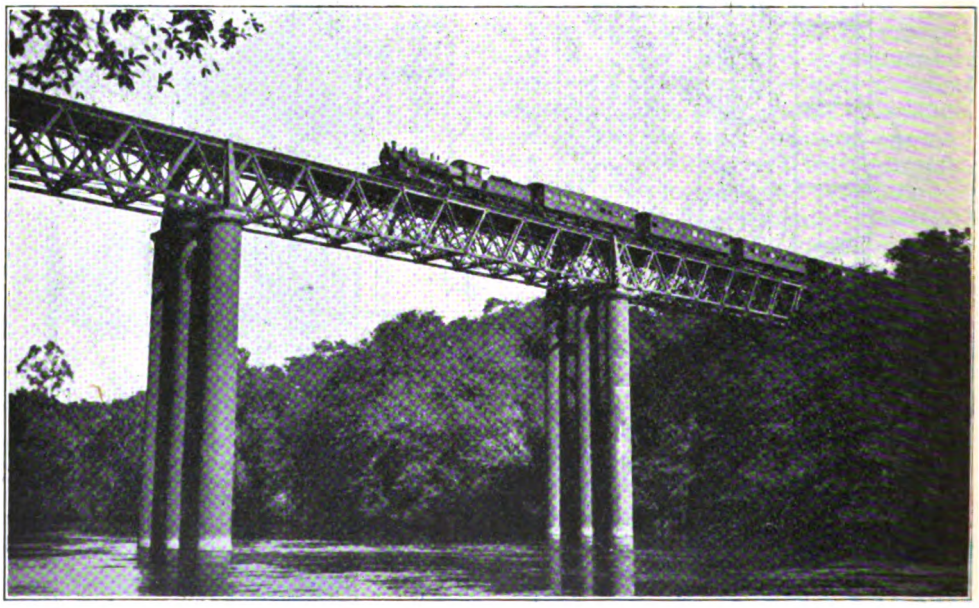

Photo.] [*W. W. Stewart.*

THIS BRIDGE SPANS THE WAIKATO RIVER, ON THE FRANKTON-ROTORUA LINE. THE ROTORUA EXPRESS IS CROSSING.

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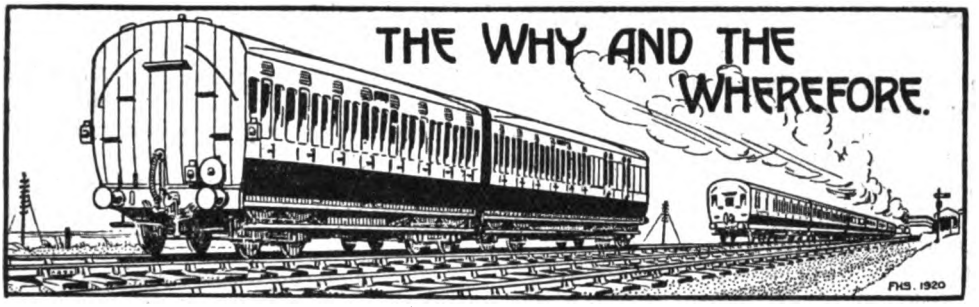

RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions and weights of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. No reader should send more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, the pages of the "Railway Year Book," should be consulted. The twenty-fifth Annual Edition of this standard railway reference work is on sale at 5s. net, or by post from the* RAILWAY MAGAZINE *Offices, 33, Tothill Street, Westminster, London S.W.1, to any part of the world, 5s. 9d.*

North and South Western Junction Railway.

The Rev. W. J. Scott, writes in regard to your queries as follows: "The 'Hammersmith Branch' of the North and South Western Junction Railway was open in November, 1858; it was not open in June 1857. Probably the actual date of opening was in the year 1858, or possibly in the autumn of 1857. The terminal station, on the north side of the Chiswick High Road, was always known as 'Hammersmith' though actually in the parish of Chiswick, co. Middlesex. The junction point was a box known as 'Acton Gatehouse,' about a quarter of a mile north of the present 'South Acton' station; at the box the down trains slipped a coach for Hammersmith; the up ones called to attach the coach, which worked through from and to Camden Road (at first 'Hampstead Road'). On the opening of the North London line to Broad Street, in 1896, the Hammersmith Branch trains ran to and from Acton main station (in 'Bradshaw' marked as 'Churchfield Road,' but always known locally as the 'North London station'), reversing at the Gatehouse Junction, and being 'propelled' thence in one direction. On the opening of the 'South Acton' station, in 1880, the branch line was prolonged southwards from that station, and it became the junction for 'Hammersmith' until the service was finally 'suspended' in 1917, and never resumed. The North and South Western Junction Railway seems to have been worked by the North London Company from the outset—whether the North London did so 'on their own' or on behalf of the two (said to be owning companies), the London and North Western Railway and the London and South Western Railway, is not quite certain. The vesting of the ownership in the three companies (Midland, London and North Western, and North London) made no difference in the way of working for passenger purposes; the line was always under the control of the North London superintendent, and, except for the short periods when the Midland Company also worked their own trains over part of the line, the trains were all North London. All three owning companies run their own goods trains pretty frequently over the line, as do also the London and South Western Company (between Willesden Junction and Brentford, via Kew Old Junction), though the latter company is not one of the owning companies." [Reply to A. J. C.]

Derelict Locomotives.

You do not say whether the locomotives you noticed in sidings on the North Wales line belonged to an English railway, presumably the London & North Western, or whether they were some of the War Department 2–8–0 locomotives. Many of the latter were taken over by English companies on loan, though we believe a number have since been returned. If these engines are in question, obviously their large dimensions would not render them suitable for working everywhere

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on many lines, either at home or abroad. You must remember also that railways are as a whole adverse to purchasing locomotives in which the details of design do not incorporate their own practice, as this complicates the question of replacements and repairs. Had the war not concluded when it did, no doubt the construction of all these engines would have been fully justified, and there are probably more serious aspects of "waste" than this, though it is to be regretted that greater use on a permanent basis is not being made of these engines.

[Reply to J. HORROCKS.]

Piloting.

Your query raises a contentious question. Piloting is never resorted to on the Great Northern Railway, and very rarely indeed on the North Eastern Railway, whereas the London and North Western and Caledonian Companies (the four lines to which you allude) pilot freely. Piloting is an expensive luxury, as it doubles the locomotive men's wages on any given train, and nearly doubles locomotive running and maintenance costs; on the other hand, it saves the single engine from undue wear and tear by thrashing, and makes for punctuality. It has the advantage over duplicating a train of shorter occupancy of block sections (very important in congested areas), provided always that the platforms at which the single train stops are sufficiently long to take it without an excessive amount of double drawing up. A rigid determination never to pilot probably makes for economy, but on the other hand it gives some very hard work to locomotives and crews at times, as well as leading to very unpunctual running.

[Reply to R. W. N. L.]

York and the Great Eastern Railway.

It was, we believe, at the beginning of July that the North Eastern Railway commenced to supply locomotive power for the Great Eastern Railway York–Lowestoft express between York and Lincoln, this arrangement being much more economical for the latter company than the use of its own engines, now that the through service is reduced to one train each way daily. As regards the other two trains you mention at York, the night postal trains to both the London and North Western and Midland lines have always been worked by the North Eastern Railway; the latter ran at one time *via* Normanton, but is now worked by the North Eastern Railway direct to Sheffield, *via* Pontefract; the former is North Eastern-hauled into Leeds.

[Reply to S. WALLACE.]

Locomotive Horse Power.

You are right in assuming that a locomotive is likely to develop a higher horse-power when running smartly up a moderate gradient than when running very slowly up one of great steepness, and that the highest horse-power figures would not be attained on so steep an ascent as the 1 in 42 of Hemerdon on the Great Western Railway. The figures you mention in the latter connection are probably fairly correct; as regards the working of the engines in such circumstances, the regulator would very likely be full open, but it is improbable that the engine would be running in full forward gear, which is very rarely employed, except perhaps at starting.

[Reply to "ERG."]

Highland Railway Locomotives.

Mr. R. Park, General Manager, Highland Railway, states that although 4-4-0 engine No. 72, *Loch Ruthven* is officially termed a rebuild, it is really a new engine built in 1917 in replacement of an old locomotive. Three engines in all of the "Loch" class were built during the war period, these being very suitable for working on certain parts of the system, while their places could not be taken by the larger locomotives of more recent design. The two 4-4-2 tank engines Nos. 485 and 487 belong to the London and South Western Railway, being lent to the Highland Company for service as a war emergency measure.

[Reply to A. D. C.]

10 a.m. ex-King's Cross.

The dead slowing through Peterborough is necessary on account of the sharp curves at both ends of that station. A stop is made at Grantham for locomotive-changing purposes, as the run from London to York and back, although occasionally made, is too lengthy to be practical as a daily locomotive "turn." We agree that the booked speed between Doncaster and York, even allowing for Selby slack, is the

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poorest part of the schedule, but on the other hand, we cannot agree that the 10 min. spent at York is any too long, in view of the great importance of the York connections.

[Reply to R. D. LUND.]

French Locomotives.

On most of the French railways, and to some extent in other Continental countries, the engines are numbered in decimal fashion, thus, 4.1713 and 3.1161, to quote your own examples. This signifies that the former engine has four coupled axles and the latter three. A four-coupled engine would thus have two as its first numeral and a ten-coupled engine would have five. The remainder is, of course, the running number of the locomotive, except that the use of the indicating numeral in the front enables the same numbers to be used otherwise in each class.

[Reply to " 2-6-0."]

Foreign Rolling-Stock on the South-Eastern and Chatham Railway.

That you noticed an ordinary local train at Cannon Street including Great Northern and London and South Western vehicles, is explained in a communication from Mr. E. C. Cox, Superintendent of the Line, South Eastern & Chatham Railway, who states that the hop pickers' traffic and the large numbers of workmen travelling to various places in Kent in connection with road-making schemes have rendered it necessary for the South Eastern and Chatham Railway to borrow stock from some of the other companies for a short period. [Reply to H. A. POPER.]

Slipping Coaches, Great Western Railway.

The subsidiary distant signal arm provided at the approach to certain Great Western Railway stations where slipping is frequently carried out, is to afford the slip guard a clear indication of the road when the ordinary upper arm is obscured by steam. The two arms work simultaneously, the lower merely repeating the upper. We note that the Swindon slip coach off the 5 p.m. from Bristol to Paddington, is now brought from the middle road at Swindon to the platform by means of a yard engine. This is the customary practice in such cases.

[Reply to " SILURIAN."]

Midland Railway Locomotives.

The absence of six-coupled express and eight-coupled mineral engines on the Midland Railway has often been commented upon. The general policy of this line is, however, to work trains in reasonably heavy formation by locomotives of ordinary types, rather than to deal with very big loads by correspondingly powerful engines, but engineering restrictions and other factors have probably influenced this policy. In any case, it is for the directors and chief officers to decide matters of this kind.

[Reply to C. M. ALTON.]

Superheater Damper Gear.

Various devices, such as steam circulators, are adopted in modern superheater engines, to obviate the burning out of superheater elements, and to replace the old damper system. At the same time, there is tendency to over-rate the danger, and as evidence of the division of opinion of engineers on the subject, certain modern superheated types have appeared without any such precautionary devices.

[Reply to " ERG."]

2-4-0 " Jumbos," London and North Western Railway.

No engines of this class have ever been converted from either the 2-2-2 " Lady of the Lake " type, or the 3-cylinder 2-2-2-0 type ; all engines of the latter two types have long since been scrapped. No. 955, *Charles Dickens*, was a 2-4-0 " Precedent " or " Jumbo." The expression " re-building " is often used to denote any heavy repair or renewal from re-boilering upwards.

[Reply to E. J. GITMAN.]

Titles of Grouped Railways.

Your suggestion that the Eastern Group should be known as the " East Coast Railway " and the North Western Group as the " West Coast Railway " has certainly good points, though, as the lines of the former will reach the west coast and of the latter the east coast, even these are open to criticism. However, we anticipate that the titles officially selected will be made public before very long.

[Reply to C. M. ALTON.]

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Mechanical Lubricators. London and North Western Railway.

We are indebted to several readers for information on the point raised in reply to E. J. Gitman. Among others, engines Nos. 238, *F. W. Webb*; 301, *Leviathan*,; 1195, *T. J. Hare*; and 2168, *Henry Maudslay*, all 4-4-0 "George the Fifth" or superheated "Precursor" class engines, have mechanical lubricators operated by return cranks driven off the left trailing side-rod coupling pin. The lubricator itself is located inside the cab. More of these lubricators, which were very successful, would probably be in use but for the fact that they were supplied, before the war, by the German firm Bosch, famous as makers of magnetos.

[Further reply to E. J. GITMAN.]

Demountable Flats.

It may be that there is something in your suggestion that the demountable flat system could be applied to railway wagons. At the same time, the difficulty arises that so many wagons would require to be fitted, only a few of which would be able to utilise their special features owing to the very wide range of journeys and duties for which the wagons may need to be employed. A somewhat analogous system, involving the use of "flats" which can be slung by cranes and thus transferred between rail and road vehicles, is already in use on the London and North Western Railway, particularly for the Bradford wool traffic.

[Reply to W. J. LEE.]

Great Western Railway Rolling-Stock in Liverpool.

We have not been able to trace any train service which would cause a Great Western Railway clerestory coach painted in the new style to be in the Cheshire Lines' Central station, Liverpool. It may, however, have been worked there specially. Your notes in regard to mechanical lubricators on London and North Western Railway locomotives are covered by a further reply to E. J. Gitman, published above.

[Reply to F. HEWITT.]

Equivalent Heating Surface.

Mr. W. T. Hoecker, of Galveston, Tex., U.S.A., explains that the term "equivalent heating surface," as used in America, means the sum of the heating surfaces of tubes, flues and firebox plus 1½ times the heating surface of the superheater. This term is applied only to superheater locomotives and was originally devised to afford some means of comparison of the boiler capacities of superheated and saturated steam locomotives. The heating surface of the superheater is considered to be 1½ times as valuable as a like amount of tube heating surface in a saturated steam boiler would be.

[Further reply to R. B. ABBOTT.]

Rolling-Stock Colours.

As the new groups are not yet fully constituted, the question of distinctive colours for engines and rolling-stock in each group has not so far arisen. This is quite a secondary matter which will receive attention when more important aspects have been dealt with.

[Reply to C. G. R. AMORY and R. H. MAURICE.]

"The 'Jellicoe' Specials."

Particulars of the running of the famous "Naval Special" between Euston and Thurso, also other special naval leave trains, such as one between Plymouth and Invergordon, were set forth in "Pertinent Paragraphs" in the February, 1919, number of THE RAILWAY MAGAZINE.

[Reply to R. HETHERINGTON.]

Speed Limits on "Underground" Lines.

As a rule, both Tube and Metropolitan and Metropolitan District trains on underground sections are limited to a maximum speed of 35 m.p.h., though at many points the permissible speed is much lower. For the remainder of your query consult "Bradshaw."

[Reply to F. Y. and N.]

East and West Yorkshire Union Railway.

Presumably the wagons you noted at Redbridge or Millbrook, London and South Western Railway, belong to the East and West Yorkshire Union Railway. This is a system of goods lines in Yorkshire owning 201 goods vehicles.

[Reply to K. W. S. M.]

Buckeye Couplings.

This is a pattern of automatic coupling extensively used for rolling-stock on United States railways. It has been employed to a considerable extent for the standard East Coast joint stock sets of vehicles.

[Reply to K. W. S. M.]

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Slipping Coaches on the London and North Western Railway.

On Division "A" of the London and North Western Railway—the original system—the practice of slipping coaches has not been reverted to since the war, either at Coventry or elsewhere, but on Division "B" (the Lancashire and Yorkshire section), slipping is still in vogue, as heretofore, at Accrington, Blackburn, Rochdale and Midge Hall.

[Reply to E. J. GITMAN.]

Midland Railway at Leeds.

Wellington station is a terminus, and through trains require the new engine attached at the rear after arrival. The old Carlisle "non-stop" avoided Leeds, engines being changed at Shipley, though this stop was not advertised. Goods trains and occasional specials avoid Leeds passenger station, using connecting loops in the vicinity.

[Reply to S. WALLACE.]

Tail Lamps on North London Railway.

Use of an ordinary tail lamp on the trains of this company is in order to conform to the practice of the London and North Western Railway, of which system the North London Railway now forms a part. Your second query raises a debatable point in regard to which no decision has yet been reached.

[Reply to J. HUTCHINSON.]

South Devon Main Line, Great Western Railway.

The 4-6-0 engines are not allowed to take more than nine of the 70-ft. stock vehicles over Dainton, Rattery or Hemerdon summits without pilot assistance—a reasonable figure, in view of the exceptional steepness of these inclines.

[Reply to P. W. J. T.]

Distances, Great Western Railway.

Milepost distances usually apply via the old main Bristol line, though for charging purposes, or as measured by the traveller, the Westbury route gives a shorter mileage. Hence the apparent discrepancy you have noticed on the Minehead branch.

[Reply to W. L. JOHNSON.]

4 p.m. Leeds Express ex-King's Cross.

It is doubtless owing to the abnormal weight of this train, which is always made up to well over 400 tons tare, that the war schedule of 101 min. is still retained to Peterborough, although we agree that the time is capable of substantial reduction, load notwithstanding.

[Reply to Commander W.R.C. MOORSOM and M. A. OLDHAM.]

Castleman's Snake.

Mr. Castleman was for many years a director and for a few the chairman of the London and South Western Railway. He died in 1877. He was the promoter of the Southampton and Dorchester Railway—at first called "Castleman's snake," by reason of its winding course.

[Reply to L. L. D.]

Calling-on Signal Arms, Midland Railway.

Midland practice follows that of the North Eastern Railway, in that the home signal above a calling-on arm cannot be lowered without the latter, whereas the calling-on arm is, of course, used independently as desired for drawing-ahead purposes.

[Reply to "SILURIAN."]

Metropolitan Railway Locomotives.

The 4–4–4 tank engines of the class illustrated as frontispiece to the September RAILWAY MAGAZINE were built by Messrs. Kerr, Stuart & Co., Limited, of Stoke-on-Trent. This information was given when the engines were first placed in service.

[Reply to "EX-RAILWAYMAN."]

The Longest Brick Viaduct.

Probably certain of the viaducts carrying railways in the London inner suburban area would claim this distinction In the country, Harringworth viaduct, on the Midland, would doubtless take a high place.

[Reply to "X.Y.Z."]

Pumps on London, Brighton and South Coast Railway Locomotives.

The pump you have noted, attached to 4-4-2 tank engine, No. 83, is a Weir feed pump, used in connection with the feed-water heating system fitted to these locomotives.

[Reply to F. L. H. F.]

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Evershot Bank, Great Western Railway.

Gradient of this bank, between Yeovil and Dorchester (coming from Yeovil direction), steepens in 1½ miles from 1 in 70 to 1 in 53, and concludes with 1½ miles more at 1 in 51½.

[Reply to L. & S.W.R.]

London and South Western Railway Locomotives.

No. 335 was illustrated in the RAILWAY MAGAZINE for May, 1921, as originally constructed and as rebuilt. It was designed by Mr. Drummond and rebuilt by Mr. Urie.

[Reply to H. G. M. ROGERE.]

Hatton North Curve, Great Western Railway.

Mr. G. A. Bamlet mentions that, according to the Great Western Railway timetables, the 9.35 a.m. from Birmingham to Honeybourne uses this curve in addition to the train mentioned.

[Further reply to J. F. READE.]

Oil Fuel on the London and South Western Railway.

As far as we are aware, no London and South Western Railway engines are now fitted for burning oil fuel, though several were so equipped during the coal strike period.

[Reply to E. J. E.]

Tractive Effort.

Formula for calculating tractive effort of compound locomotives has been given more than once in these columns. That for electric locomotives is too complex a matter to enter upon here.

[Reply to F. V. LYS and W. A. CLAYDON.]

South Eastern and Chatham Railway Locomotives.

There are no compound engines of any description on this railway. Some R.O.D. 2-8-0 engines were in use for a time, but they have all now been returned.

[Reply to N. S. JEFFRIES.]

Trial Trip, Metropolitan Railway.

The wagons used for the train illustrated on page 173 of the September RAILWAY MAGAZINE were, we believe, those in use by the contractors who constructed the line.

[Reply to H. M. KENNEDY.]

Slip Coaches.

See table in "VOYAGEUR'S" article in the October number for statistics of slip carriage services. For particulars in detail, please consult *Bradshaw* or the railway timetables.

[Reply to "FRIAR."]

Metropolitan District Rolling-Stock.

The tare weight of the new motor cars is 44 tons 10 cwt. 1 qr., of the control trailer cars, 25 tons 16 cwt. 3 qr., and of the ordinary trailer cars, 24 tons 10 cwt.

[Reply to G. KING.]

Arched Corrugated-Iron Station Roofing.

Mr. G. Moody mentions that this type of roofing is employed also at North Dulwich station, London, Brighton and South Coast Railway.

[Further reply to "CROUCH HILL."]

"Flats" on Wheel-Tyres.

These are very easily caused by violent brake applications resulting in a skid of the wheels along the rails, and cannot be got rid of finally until a new tyre is fitted.

[Reply to "FOUR-WHEELER."]

Steep Gradients.

Pilatus Railway in Switzerland has an average gradient of 48 per cent. (a shade over 1 in 2) for about three miles. Your other query is unsuitable for reply.

[Reply to T. W. LINSELL.]

Grouping and Through Services.

It is quite impossible for us to say, at this date, how grouping will affect the various through train services. We note the contents of the rest of your letter.

[Reply to J. R. BLABY.]

"Cowlairs Works, 1921."

The application of this plate to engines which are not new is doubtless intended to indicate that they have been through the works for heavy repairs at the date mentioned.

[Reply to "AULD REEKIE."]

South Eastern and Chatham Railway.

Nos. 791 to 809 are blank, presumably to provide for additional 2-6-4 tank engines of the 790 class in due course.

[Reply to H. A. YOUNG.]

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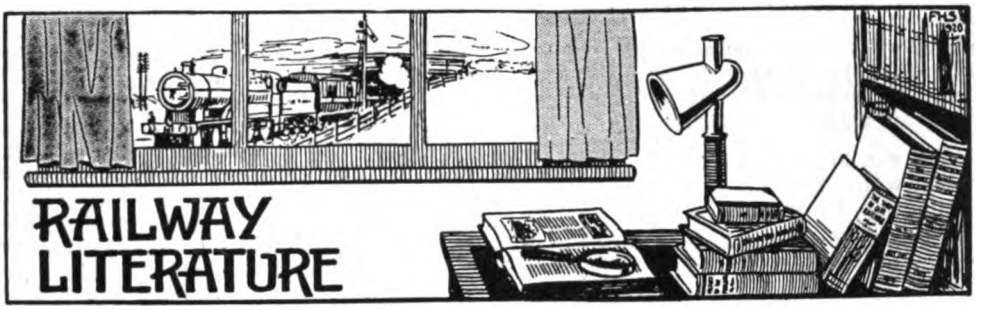

UNIVERSAL DIRECTORY OF RAILWAY OFFICIALS, 1922. [The Directory Publishing Company, Limited, 33, Tothill Street, Westminster, London, S.W.1. Price 20s. net.]

Now in its twenty-eighth year of publication, this volume of 644 pages is unique in that it gives the names and addresses of directors and chief, assistant, divisional and district officers, in all departments of *every* railway in the world, including not only the great systems, but also hundreds of small lines of various types, and those tramways which are technically railways. It is of great use to all manufacturers doing business with railways at home and abroad. Particulars are also given of associations and other organisations (foreign as well as British) connected with the railway industry. The wide scope of the work will be gathered from the fact that in the respective sections the numbers of railways covered are: England and Wales, 431; Scotland, 73; Ireland, 60; Europe, 1,100 (classified in accordance with the changed international situation and with particulars as complete and up to date as practicable in the case of Russia and other unsettled countries); Asia, 368; Africa, 64; Australasia, 26; North America, 189; Central America, Mexico, &c., 101; South America, 217. In each case a few statistics as to mileage, gauge, numbers of locomotives, &c., are given, while the names of foreign railways appear in the language of the country, though accompanied by an English equivalent. Special value attaches to the indices to countries covered and to individual railways and tramways by name (about 2,700 entries), with a personal index to railway directors and officers (190 pages, 22,000 entries) The volume is substantially bound with a view to frequent office reference. That it is right up to date is shown by the fact that it includes particulars of the changes in railway constitution and personnel effected by reason of the Great Western Railway amalgamations and absorptions.

THE STORY OF THE CAMBRIAN. A Biography of a Railway. By C. P. Gasquoine. [Oswestry: Caxton Press, Woodall, Minshall, Thomas & Co., Limited. Price 6s. net.]

This book of 157 pages contains a map and numerous illustrations and portraits. In it is recorded 70 years of struggle, triumph and Welsh railway romance. The work embodies 11 chapters and an appendix, and is provided with an extremely well-arranged and comprehensive index.

Following as it does the termination of the Cambrian Railways separate existence the book will be welcomed in many quarters by reason of its valedictory character. It possesses special merits as a biography, and students of railway history will appreciate not only its attractive style but likewise the sense of proportion the author has exercised in his testimony of the various events he has had to record.

MODEL ELECTRIC LOCOMOTIVES AND RAILWAYS. [By Henry Greenly. Cassell & Co., Limited. Price 6s. net].

This is a companion volume to Mr. Greenly's book on "Model Steam Locomotives," reviewed recently. It is illustrated by 326 photographs, diagrams and working drawings. Many interesting illustrations are included, among them being some of an historical character, such as outline diagrams of early locomotives on main railways. Special attention is given to designs for reproducing on a small scale electric locomotives in use on standard railways at home and abroad. These aspects are mainly covered in the first two chapters. Remaining sections deal with the electric motor and how it works; practical model electric railway systems; locomotive control and reversing; the design of model traction motors; power transmission from motor to wheels; the use of coupling rods, collecting shoes, overhead bows and track bonding, and control and equipment. Two further chapters deal respectively with electrically-operated signals and with the supply of power for model railway use. The book covers the application of electricity for working models outwardly representing steam locomotives, as well as designs professedly electric. This

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volume will no doubt be welcomed by a wide circle of readers in view of the high reputation as a model locomotive designer and consultant achieved by Mr. Greenly.

GENERAL MAP OF EUROPE. [John Bartholomew and Son, Limited, Duncan Street, Edinburgh. Price 1s. net.]

This map shows the boundaries of States according to treaties. It is printed in colours and its size is 35 in. by 23 in. At a time when many eyes are turned anxiously to the Near East, the new edition of this map of Europe will be found useful and instructive. Inset at the top right-hand corner is a smaller map showing the boundaries and countries as they were in 1914.

It possesses all the qualities associated with cartographical work issued from the Edinburgh Geographical Institute.

A Unique Collection of Railway Tickets.

WHAT is believed to be a unique collection of railway tickets has been brought to our notice, primarily with a view to sale, though the particulars supplied indicate that it is both interesting and valuable in circles where matters of this kind are appreciated. It has been compiled by a German collector, and includes some 110,000 tickets of more than 40,000 different types. It covers most of the world and nearly 1,200 railways are concerned. Included are tickets dating back to 1844, together with some old maps of 1838, 1839 and 1840. The collection is contained in 65 sections, each containing cartons to which the tickets are attached by gummed strips, the whole being classified and indexed. The tickets are, for the most part, used, but clean and without checking marks, while there are also some specimen prints. The following indicates the scope of the collection :—

PART I.

Country—	Railways.	Tickets.
Germany	372	34,400
Austria-Hungary	113	13,200
Switzerland	93	4,800
France	80	3,400
England	92	3,000
Sweden	74	1,700
Denmark	21	460
Norway	5	130
Belgium	13	880
Netherlands	4	600
Luxemburg	3	70
Italy	31	960
Spain	41	1,360
Portugal	7	440
Balkan States	11	450
Russia	40	1,720
North America	34	1,240
Central America	13	150
South America	78	18,000
Asia	44	780
Africa	13	500
Australia	3	56

PART II.

German Railways since the Reform, May 1, 1907.

Group 1—	Tickets.
Peace time	17,800
War issues—with control letters	4,000
With alteration of price	8,200
With printing on back	600
Double printing	16,000
With double price	700
With station stamps	1,060
War tickets	450
With class figure	1,540
With errors, printing on back, numbers	1,850

	Railways.	Tickets.
Part I	1,185	72,000
Part II	—	38,000
Total	—	110,000

Obviously a large proportion of the tickets are obsolete and could not be replaced. Hence, to anyone interested, the collection would be most valuable. In fact, it is claimed that no other collection of its kind is in existence, compiled on so complete a basis. Besides many valuable old tickets, there is one of which a specimen some years ago realised, so we are informed, the price of 18,000 mk. at an auction of antiquities.

In the China section there is a complete set of tickets of the Shanhaiguan–Tientsin–Pekin Railway, which was destroyed in the Boxer rising of 1900, and once more rebuilt and set in working order by railway pioneers. By order of the Commander-in-Chief of the Allied troops, these tickets were handed over to the collector."

In the Transvaal section is an interesting set of tickets :—(1) Written by hand on paper ; (2) Tickets with rubber stamps, the station names being written by hand ; (3) Tickets with station names, &c., all printed by rubber stamp ; (4) An old travelling warrant written by hand. The price asked for is £500, and we shall be pleased to place interested readers in communication with the vendor, either for further particulars or with a view to the submission of an alternative offer.

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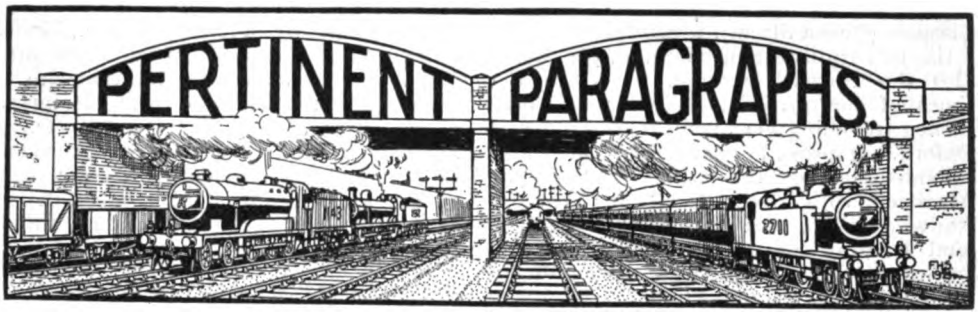

Sir Sam Fay on Railway Management.

It was a practical idea on the part of Sir Sam Fay to deal with the question of railway management in his presidential address to the Institute of Transport on October 2. The address was further notable in that it was well sprinkled with epigrammatic references to railway matters, and was highly appreciated by the large gathering of members. In Sir Sam Fay's view " Reconstruction " was not the most suitable term to describe recent State policy towards transport. He preferred to call it financial and physical consolidation, and regarded as an asset to the companies the physical change brought about by forming four large companies arranged on a " fairly equitable geographical basis." The provisions of the Railways Act, 1921, were then briefly but critically analysed. References were also made to labour problems, and to the clauses in the Act providing for compensation by reason of Government control.

The evolution of railway administration was next considered, and extended reference was made to the development of the " Committee " system of control. This theory of management naturally involved considerable delay, waste of time and the deadening of initiative. As, however, transport of all industries needs flexibility and prompt decision, an organisation clothed with authority to deal with problems as they arise is essential. This will be all the more important in the future in view of the proviso in the Railways Act that " efficient and economical working and management " is a justification for the standard revenue, as under this clause management may be called in question by the State or by any association representing the public.

Finally, he dealt with the problem of organisation and urged that there was a probability that the directors of the larger of the new companies would be forced to consider the adoption of an organisation somewhat similar to that of railways on the other side of the Atlantic. He referred specifically to the Canadian Pacific Railway controlled by a president and four vice-presidents representing respectively finance, operation, commercial questions and the law, and went on to say that the corollary of such an organisation would be the splitting up of the lines into divisional areas under divisional superintendents—say three or four for each group—of a size, which after taking into consideration density of traffic and other circumstances, came within the limits of human capacity. Under such a scheme, the divisional superintendents, aided by their technical assistants, could be left a wide discretion to develop the areas in their charge. Among other advantages, it was Sir Sam Fay's view that divisional sub-management would soften the transfer from constituent company to group control, and that the jarring elements would be less discordant under this scheme than under centralised detailed administration.

Glasgow to Southampton and Harwich.

Last autumn special interest attached to the introduction of through carriage facilities between Aberdeen and Penzance, a service which has fully justified itself, certainly for journeys of an intermediate character which it rendered very convenient, and largely also in regard to traffic between places north of Edinburgh and west of Plymouth, for which it primarily catered. This autumn another equally important development has to be chronicled, the extension of through carriage facilities, already afforded between Glasgow and Edinburgh and Southampton, into a train independently of the London services. With this is associated a new feature, through carriages between Glasgow and Edinburgh and Harwich (Parkeston Quay) in connection with the Great Eastern Railway Continental steamers. An interesting point is that a relief Edinburgh-London train is utilised north of York, the 10.15 a.m. from Edinburgh, which, when it is no longer required as a second part of the 10.0 a.m. express from King's Cross, from November 1, becomes the new Southampton train. Actually the train utilises the 8.40 a.m. from

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Glasgow (Queen Street), which thus becomes a through train to Southampton, conveying also the Harwich section. It keeps the times of the 10.15 a.m. as far as York, thence travelling via Sheffield (G.C.R.) and Oxford. Improved connections are also provided during the winter months at Aberdeen with Great North of Scotland Railway trains, and at Perth with Highland Railway trains. These developments are of special interest in that they indicate not only the possibilities which may follow the co-ordination of effort between railways in the same group, but also the opportunities for introducing new facilities brought about by the spirit of co-operation which is becoming very strongly manifested between groups.

Institution of Locomotive Engineers.

ON Friday, September 29, a meeting of the Institution of Locomotive Engineers was held at the Engineers' Club, Coventry Street, W., at which the incoming President, Mr. Robert H. Whitelegg, Chief Mechanical Engineer of the Glasgow and South Western Railway, delivered his inaugural address. The proceedings started at 7 p.m., with Colonel E. Kitson-Clark, the retiring President, in the chair, a fairly numerous gathering of members being present.

Colonel Kitson-Clark, in bidding welcome to the new President, briefly reviewed the development of the Institution and the work achieved during his year of office. In the course of his brief but interesting statement, he gave figures relative to the growth of the Institution at its various centres at home and abroad, showing that at the present time the body consists of 1,019 members of all ranks, whilst the names of further applicants are put forward at every meeting. The chair had, he said, been occupied at various times in the past by prominent locomotive engineers and as everyone among them would realise, they might look forward under the new President to the further advancement of the Institution.

Mr. Whitelegg, on taking the chair, after responding in a suitable manner to the references made to himself and acknowledging the cordiality of the reception accorded him, commenced what proved to be a highly interesting address, differing in some respects from ordinary procedure on such occasions and partaking more nearly of the character of a paper, the main purpose of which was to show the important part taken by locomotives and locomotive departments in the commercial aspect of railway operation as distinguished from what might be termed the "practical or engineering side."

At the conclusion of the address a vote of thanks to the President was moved by Mr. Arthur Campling, of Kitson and Co., Limited, and cordially responded to by the members, Mr. Whitelegg acknowledging the vote and its reception in suitable terms. The meeting closed after Mr. C. N. Goodall, O.B.E., Managing Director of Robert Stephenson and Co., Limited, had proposed a vote of thanks to the retiring President, Colonel Kitson-Clark, to which the latter made a suitable response.

Railway Auxiliary Activities.

LIKE other leading British railways, the Great Northern is not entirely dependent upon outside manufacturers for all the articles used in carrying on its business. The concrete depôt at Derby is a case in point. This was established several years ago for the purpose of making in plain and reinforced concrete articles for use in maintenance of the line, these consisting chiefly of fence posts and posts of various descriptions for notice boards, mile posts, gradient boards, lamps, gates, &c., considerable quantities of concrete slabbing and copings for platform walls, also bearers to take the place of bedding timbers, and cesspits for use in formation drains and such like articles. The number of articles varies, of course, from time to time according to requirements, but in all, last year, there were turned out from the factory about 17,000.

Then at Hall Hills, Boston, the company creosote their own sleepers, and normally deal with about a quarter of a million sleepers and about 200,000 lineal ft. of crossing timbers per annum, in addition to telegraph poles, bridge timbers, &c. At Peterborough there is a foundry where all chairs and general castings required for the engineer's use are turned out, the normal output approximating to 10,000 tons.

At Peterborough, too, the Great Northern bakery is located, where bread and confectionery is made for the company's hotels and dining cars. There is also a factory at Peterborough for the making of wagon sheets. All the Great Northern passenger tickets are printed at the stationery stores, Holloway, while leather articles such as harness, nosebags, cash-to-bank bags, &c., are manufactured by the horse department at Leeds.

Preston Guild Traffic.

ONCE every 20 years the inhabitants of Preston celebrate the fact that some 800 years ago Preston was constituted a free borough with a Guild Merchant. The ceremonies and festivities held in connection with the celebrations are extremely popular, and during Guild Week, there is a large influx of visitors to the town. Thus arises the special railway interest attaching thereto,

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and when it is remembered that Preston is a busy through station and junction on the West Coast route to Scotland, it will be appreciated that the railway arrangements had to be planned with care.

The days on which the capacity of the station and the energies of the staff were tested to the fullest extent this year were Wednesday, September 6, and Saturday, September 9, and on each of these days close on 80,000 people arrived at Preston for the Guild celebrations. On September 6 (the opening day of the Royal Lancashire Show, also held at Preston) the Trades Procession took place, but as this was held in the morning the return traffic began at 1 p.m., and the bulk of the passengers departed before a late hour. On September 9, however, the method of working had to be altered to meet a different set of conditions. Instead of the passengers arriving and departing early, the morning trains were only moderately full, while the later trains, including a number added to meet emergencies, were heavily loaded until 9 p.m. The event of the evening was a torchlight procession, and about 75 per cent. of the visitors stayed until the finish of the festivities and then wished to depart by train. At the station entrance special barriers had been erected, and these proved effective in avoiding undue congestion in the station. To assist in the handling of the traffic, Butler Street goods yard was cleared of goods traffic and used temporarily under special arrangements as a passenger station. This accommodated a large number of the additional trains and materially helped to ensure the smooth working of the traffic.

Numbers of Passengers and London & North Western Railway Exhibits.

By the courtesy of Mr. Ashton Davies, General Superintendent, and Mr. T. W. Royle, Assistant General Superintendent, Northern Division, London and North Western Railway, we are able to publish statistics as to the volume of passenger traffic in and out of Preston. During the week the following tickets were issued to Preston: Sunday, 12,000; Monday, 19,000; Tuesday, 25,000; Wednesday, 79,000; Thursday, 25,000; Friday, 19,000; Saturday, 79,000; total 258,000; daily workmen and market tickets, 6,000; 3,225 weekly contracts, equal to 20,000 journeys, 20,000; grand total, 284,000.

The tickets issued at Preston during Guild Week totalled 49,000. Altogether 961 special trains were run, 504 inwards and 457 outwards. It may be added that a factor contributing largely to the success achieved in dealing with the departing passengers was the series of direction posters and sheets showing the times of special trains and the stations and platforms from which they would depart. These were exhibited prominently in various parts of the town and were freely consulted by the visitors.

The London and North Western Railway also helped towards the success of the huge Trades Procession on Wednesday, September 6, by the loan of the following exhibits which were conveyed on decorated lorries through the streets, six vehicles being utilised for the purpose, the idea being to demonstrate the evolution of railways:—(1) Model of Stephenson's "Rocket"; (2) Model of first-class passenger vehicle used on the Manchester and Liverpool Railway; (3) Model of coach built for North Union Railway in 1842; (4) Model of King's saloon; (5) Model of passenger engine "Sir Robert Turnbull"; (6) Model of ss. *Anglia*, Holyhead and Kingstown service.

Some of the models were transferred from the Large Hall at Euston, and the trouble taken in adapting these for conveyance through the town was highly appreciated by the great crowds lining the route. An appreciative letter was received by Mr. Ashton Davies from the Mayor of Preston regarding the manner in which the heavy traffic was handled.

Locomotive Oscillation Tests on the London, Brighton and South Coast Railway.

A comprehensive series of tests were recently carried out by Colonel L. B. Billinton, Locomotive Engineer, London, Brighton and South Coast Railway, with the object of arriving at definite conclusions as to the relative actions of varying bogie control systems and locomotive wheel arrangements, whilst hauling heavily loaded express trains often running at very high speeds. The engines tested comprised 4-6-4, 4-6-2 and 4-4-2 tank engines, and 4-4-2 and 4-4-0 type locomotives with tenders. The main dimensions and general characteristics of the engines can be gathered from the accompanying diagrams. The only type with a "symmetrical" wheel arrangement, namely, the "L" class express tank engine with the 4-6-4 wheel arrangement, proved in the majority of cases the steadiest of all when running at high rates of speed.

The experiments extended throughout the journey between Brighton and London, the train selected for the purpose being the heavy business express leaving Brighton (Central) station at 8.15 a.m. for London. This was made up of 10 main line coaches, eight being 54 ft. long over underframes, one 50 ft. and one 48 ft., also one six-wheeled brake next the engine. The load, exclusive of the weight of the engine itself, was 280 tons, and the booked time allowance for a distance of

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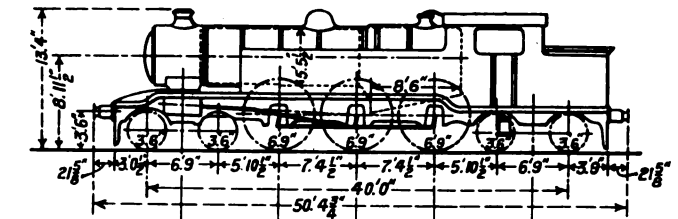
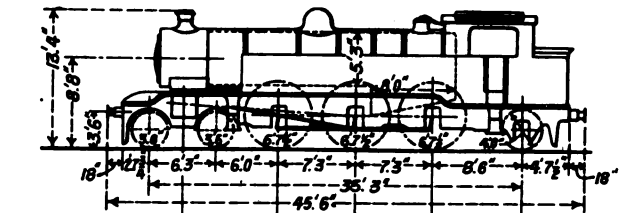
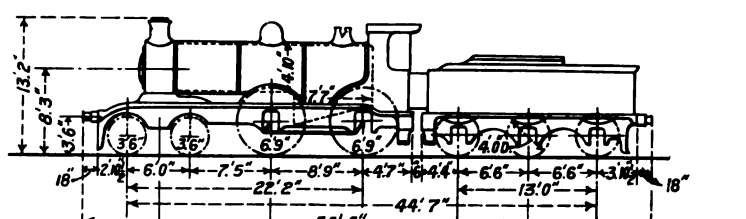

WEIGHT FULL T. C. 98-5 T. C. 19-5 T. C. 18-10 T. C. 19-0 T. C. 19-0 T. C. 22-10
OUTS. CYLRS 22" DIA. X 28" STROKE. LATERAL CENTRES 6'7½"
TRACTIVE FORCE AT 90% PRESSURE = 25598 LBS.
TOTAL BOGIE SIDE PLAY = 7½".

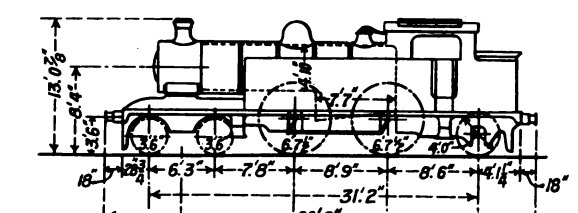
CLASS L.


WEIGHT FULL T. C. 89-0 T. C. 18-0 T. C. 17-5 T. C. 19-5 T. C. 18-0 T. C. 16-10
OUTS. CYLRS 21" DIA. X 26" STROKE. LATERAL CRS. 6'6½"
TRACTIVE FORCE AT 90% PRESSURE = 22070 LBS.
TOTAL BOGIE SIDE PLAY = 4½".

CLASS J.


WEIGHT FULL T. C. 51-10 T. C. 16-2 T. C. 18-3 T. C. 17-5 T. C. 12-5 T. C. 11-10 T. C. 11-10 T. C. 35-5 FULL
INSIDE CYLRS 19" DIA. X 26" STROKE. LATERAL CRS. 2'1"
TRACTIVE FORCE AT 90% PRESSURE = 18770 LBS.
TOTAL BOGIE SIDE PLAY = 1½".

CLASS B4.


WEIGHT FULL T. C. 76-0 T. C. 21-5 T. C. 19-5 T. C. 18-15 T. C. 16-16
INSIDE CYLRS 21" DIA. X 26" STROKE. LATERAL CRS. 2'1"
TRACTIVE FORCE AT 90% PRESSURE = 20770 LBS.
TOTAL BOGIE SIDE PLAY = 4½".

CLASS I3.

DIAGRAMS OF LONDON, BRIGHTON & SOUTH COAST RAILWAY LOCOMOTIVES, CLASSES L, J, B4, I3, USED FOR OSCILLATION TESTS.

(Diagram of Class H1 locomotive on opposite page.)

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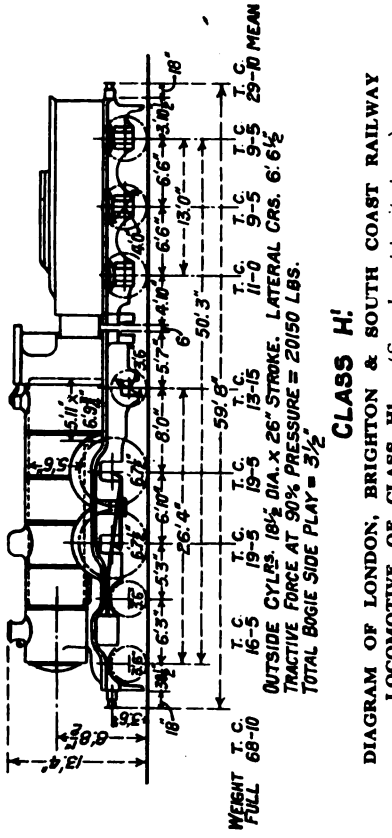
50 miles 4 chains, 1 hour 10 min., inclusive of a stop at East Croydon.

On the principal high speed section there are curves at four points, that of the smallest radius being one of 54 chains, with others of 100, 168 and 6,219 chains. Short level stretches occur between the curves until nearing milepost 40, where the line commences to ascend. Short down grades of 1 in 151 and 1 in 222 alternate with longer but more gradual slopes, the conditions being thus very favourable to the maintenance of fast running, and therefore wholly suitable for the purpose of testing



the steadiness in running of several different types of locomotives.

Apparatus for recording the movements of the respective engines was employed, the movements of the bogie centre being transmitted to a pencil operating on a recording band worked by suitable clockwork and reproducing at 2½ magnifications. The action is positive, but facilities are provided for adjusting the points to zero, and taking up any slack which might develop in the wire during running. The slightest movement of the bogie, therefore, operates the pencil, which draws the graph of deflection from the centre as the paper is being unrolled from the drum. In other tests the instrument used was the standard type of Wimperis Accelerometer manufactured by Messrs. Elliott Bros., of London, S.W. Each diagram was taken while the train was passing over precisely the same stretch of road, and as nearly as possible at the same speed. An interval of a few days only occurred between tests, so that the condition of the road could be accepted as not having appreciably altered during the progress of the trials.

Results of the Tests.

THE tests were planned to determine the relative performances of the different types in respect of :—

(1) Transvese vibration (instrument fixed in cab).
(2) Combined turning and lateral movement.
(3) Transverse vibration (smokebox end).
(4) Lateral movement only.

The 4-6-4 type tank engine gave superior results to any other as regards transverse vibration at both ends, also being a good second to the 4-4-0 type engine with tender in combined turning and lateral movement and lateral movement only.

Summarising the results obtained both by actual observation and measurement of the diagrams, the various classes of engines can be placed in the following order of merit :—

Transverse vibration (cab.)	Transverse vibration (smokebox.)
4-6-4 tank.	4-6-4 tank.
4-6-2 tank.	4-6-2 tank.
4-4-2 tender.	4-4-2 tender.
4-4-2 tank.	4-4-2 tank.
4-4-0 tender.	4-4-0 tender.
Combined turning and lateral movement.	**Lateral movement only.**
4-4-0 tender.	4-4-0 tender.
4-6-4 tank.	4-6-4 tank.
4-4-2 tender.	4-6-2 tank.
4-4-2 tank.	4-4-2 tank.
4-6-2 tank.	4-4-2 tender.

In the express passenger tank engines of the " L " class, the bogie arrangement is such that lateral control is effected by two springs, so that the weakening of either or both does not in any way affect the centralising of the bogie, but only the initial compression of the spring in leaving the curve.

The bogies fitted to the 4-6-2 and 4-4-2 tank engines, also the " Atlantic " or 4-4-2 locomotive with tender, are of the single-pin swing-link type, without any spring control whatever, and these entirely rely upon the versed side of the swing-link to give the necessary load for the lateral control.

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In the case of the 4-4-0 type engine with tender, the bogie control is effected by two lateral springs, this arrangement having the objection that in the event of one of the springs settling down or losing its initial compression, there is a tendency for the bogie to ride out of centre continuously with more or less flange pressure on the straight road.

The general behaviour of the "L" class engine throughout the tests certainly indicates that the type of bogie with which it is fitted is one of the steadiest running of any employed. Careful inspection shows that not only does this class of bogie lead well on curves, but also recovers itself earlier, and invariably takes up a central position. The quick recovery of the 4-6-4 type engine bogie in passing through a crossing was very noticeable.

Another interesting point is shown by the fact that on the 4-6-4 class the leading coupled wheels exhibit rather less flange wear than the other types, showing that the bogie is fully capable of carrying out the work for which it is intended in leading and easing the flange pressure on the coupled driving wheels.

In order to ascertain whether outside cylinders of large diameter influence any turning or nosing movement on the engine the instruments were fitted with large magnifications so as to record what movement, if any, was present. No sign of any movement of the kind referred to was obtained during the starting effort.

Institute of Transport.

A VERY satisfactory report for the year 1921-22 has been issued. Early in the year the Ministry of Transport invited the Institute to investigate an important situation which had arisen in regard to the training in England of Siamese railway students and to submit recommendations appropriate to the occasion. A sub-committee was accordingly appointed to examine the question at issue, and comprised the President, Messrs. Philip Burtt, H. H. Gordon, Arthur Watson, C.B.E., and the Hon. Secretary. After carefully considering the matter in all its bearings, the sub-committee made a number of valuable recommendations. These were adopted by the Council and afterwards placed before the Ministry. Mr. Arthur Neal, Parliamentary Secretary of the Ministry subsequently expressed thanks for the valuable work which the Institute had done in undertaking the investigation in question, and added that the sub-committee appointed by the Institute had reached most important conclusions.

Later, the Institute was requested by the Government to ascertain whether British railways would be prepared to offer adequate facilities for the training of students sent to this country by certain foreign State railways. By the courtesy of the general managers of some of the leading British railways, the Council will be enabled to advise the Government that places can be found in this country for a limited number of such students, who, upon taking up appointments in their native land, will, naturally, entertain a preference for the methods and equipment of the country in which they received their training. Representatives of the Institute were invited to attend the Air Conference held in London in February, 1922, while the Institute has been associated with many other transport developments of the period.

Reference is made in the report to the Congresses in October, 1921, and May, 1922, and to the fact that the Council has undertaken suitably to celebrate principal events in transport history, and will arrange for celebrations of the centenary of the opening of the Stockton and Darlington Railway in 1825, and of the locomotive trials at Rainhill in 1829. It is considered that a suitable way of celebrating these two events would be for the Institute to hold its Annual Congress in each of the years 1925 and 1929 in the vicinity of Stockton and Darlington and of Rainhill, respectively, and, in connection therewith, to devise appropriate methods for the celebration of such events.

On September, 30, 1922, the roll of the Institute was as follows:—Resident within the United Kingdom: members, 464; associate members, 260; graduates, 351; students, 129. Resident outside the United Kingdom: members, 55; associate members, 47; graduates, 8; students, 4. The total membership is now 1,318, as compared with 1,081 for 1920-21 and 652 for 1919–20.

Programme of Meetings.

THE following arrangements have been made for the 1922–23 session:—November 6, "British Railway Operating Statistics and their Lessons," Sir William Acworth, K.C.S.I.; December 4, "Passenger Transport by Road in Rural Areas," Mr. Sidney E. Garcke; January 1, 1923, "Air Transport," Mr. F. Handley-Page; February 5, "Wagon Stock on British Railways," Mr. H. N. Gresley, C.B.E.; March 5, "The Operation of a Railway-owned Port," Mr. G. S. Szlumper; April 6, "The Influence of Transhipment on rail-borne and Road Traffic, with special reference to the most Economical Methods of Labour-saving Appliances"—Labour-saving Appliances: Mr. C. Bentham, Operating: Mr. J. Rostern, C.B.E.; May 7, "Investigation of the Return on Capital Expenditure

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resulting from Electrification," by Sir Philip Dawson, M.P.

Lectures for Graduates and Students include the following :—November 21, " The Distribution Organisation of a Large Departmental Store," Mr. W. H. Gaunt, O.B.E.: December 19, " The work of the Aire and Calder Navigation," Mr. W. H. Breach, O.B.E.; January 16, 1923, " The Employment of Transport in Relation to Post Office Operations," Mr. H. C. Gunton, M.B.E.; February 20, " Modernisation of Passenger Railway Stations," Mr. F. Bushrod O.B.E. and Mr. J. F. S. Tyler; March 20, " Town Planning and Re-modelling in Relation to Traffic," Mr. W. S. Richmond, C.M.G., Mr. C. L. Pepler; April 17, " The Prevention of Traffic Accidents," Mr. H. E. Blain, C.B.E.; May 15, " The Design and Maintenance of Commercial Motor Vehioles," Mr. G. J. Shave.

Arrangements made by the North Western Local Section of the Institute of Transport include the following: October 19, Manchester University: " Imperial Air Services," Sir W. Joynson-Hicks, Bart., M.P.; November 16, Manchester Geographical Society's Rooms, Manchester: " The Functions of Inland Waterways in the National Transport Service," Colonel F. Rayner, D.S.O., T.D.; December 21, Liverpool University: " The Organisation of a Trans-Atlantic Passenger Liner," Mr. A. D. Mearns; January 18, 1923, Manchester University: " Some Important Aspects of Railway Traffic Operation," Mr. Ashton Davies, M.B.E.; February 2, Annual Dinner: Manchester; February 15, Liverpool University: " Some Factors Relating to the Growth of Passenger Traffic, and Means of Meeting the Demand in large Cities," Mr. H. H. Gordon, B.A., A.M.Inst.C.E.; March 15, Preston: " Heavy Road Transport," Mr. Norman E. Box; April 19, Manchester Geographical Society's Rooms, Manchester: " The Work of the Aire and Calder Navigation," Mr. W. H. Breach, O.B.E.

Fish Traffic at Lowestoft.

OCTOBER sees the commencement of the herring fishery season at Lowestoft and from all advance reports available, it would make it appear that this year's haul will be above the average. Those who have not had the opportunity of visiting Lowestoft during the annual " fish " harvest have no conception of the vast amount of activity which thrills this otherwise peaceful and invigorating east-coast health resort. Hundreds of tons of fish are landed daily on the dock wharves, and, after spirited bidding by fish buyers (representative of nearly every big town in the British Isles, as well as certain European countries), is packed for shipment. At this stage an enormous amount of work devolves upon the Great Eastern Railway, who have set aside special sidings adjoining Lowestoft station, and from these sidings all fish traffic—other than small consignments sent by passenger train—is dealt with. It is no unusual sight during the heaviest time of the herring season to see at one time four or five long express goods trains, awaiting instructions to proceed, with consignments of fish to all parts of England.

At this period of the year there are also exceptional opportunities for the amateur fisherman, who can ply his rod from the harbour, pier or beach, at very little trouble or expense. Good catches are obtainable of cod, haddock, plaice, &c., and for the enthusiastic sea angler, nothing can be more desirable and profitable than a late holiday or long week-end at this bracing east-coast resort.

North British Railway Locomotive No. 224.

REFERRING to the article published last month, Mr. W. B. Thompson, of Brampton, Cumberland, mentions that this engine was one of the first series of inside-cylinder 4-4-0 express engines ever built, and thus can claim historic importance on that ground as well as in connection with the Tay Bridge disaster and as having been, in later years, one of the " only three inside cylinder tandem compounds " ever built in Great Britain, and probably elsewhere. Mr. Thompson argues therefore that the credit of introducing this characteristically British type belongs strictly to Mr. Wheatley and not to Mr. S. W. Johnson, on the Great Eastern, or Mr. James Stirling on the Glasgow and South Western Railway. Apart from such engines for express traffic, Mr. Thompson mentions the " 492 " class locomotives on the North Eastern Railway, built for the Whitby line in 1864.

Welsh Highland Railway.

PARTLY in reply to queries, but also in view of developments in progress and in prospect, the following particulars kindly furnished by Mr. E. G. Tyrwhitt, General Manager of the Festiniog and Welsh Highland Railways, will no doubt be appreciated by many of our readers.

The Welsh Highland Railway was incorporated by the Welsh Highland Railway (Light Railway Order) 1922, which transferred to that company the undertakings of the North Wales Narrow Gauge Railway and the Portmadoc, Beddgelert and South Snowdon Railway, and revived the powers of compulsory purchase, &c., conferred on the latter company by various orders, and transferred them to the Welsh Highland

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Railway. Immediately on the order being made, work was commenced on the reconditioning of the North Wales Narrow Gauge portion, and the construction of the new railway from Rhyd-ddu (South Snowdon station) to Beddgelert and Portmadoc. Work on the old North Wales Narrow Gauge Railway was sufficiently far advanced to open the section from Dinas to South Snowdon on July 31, and the work on the new line is now actively proceeding.

The route to be followed from South Snowdon is to Pitts Head, and thence on the west bank of the Afon Colwyn to Beddgelert. From Beddgelert to the Pass of Aberglaslyn the railway will closely follow the west side of the Beddgelert-Portmadoc Road for about a quarter-of-a-mile, where it crosses the road and the Afon Glaslyn to the east bank, which is followed to the Pass of Aberglaslyn. In the pass there are three tunnels, 110 ft., 40 ft. and 925 ft. long respectively. From the pass the railway follows the Aberglaslyn Penrhyn road for half-a-mile, and thence the valley of Glaslyn to Portmadoc. At the southern end it uses the track of the Croesor Tramway, the only portion of the Portmadoc, Beddgelert and South Snowdon Railway that was completed. At Portmadoc the Welsh Highland Railway connects with the Festiniog Railway by a trailing junction, but powers are now being obtained for a new short junction railway in Portmadoc to effect a facing junction.

All these works will be completed early next spring, and it is then the intention to run through trains from Blaenau Festiniog, on the Festiniog Railway, to Dinas Junction, the northern terminus of the Welsh Highland Railway, and in the not very distant future the railway may be extended to Carnarvon. Powers for this have been obtained subject to the assent of the Ministry of Transport.

The Welsh Highland Railway is the same gauge as the Festiniog Railway, viz., 1 ft. 11½ in., and the rolling-stock is interchangeable and will be used throughout.

The wonderful scenery of the Festiniog Railway is well known to many of your readers, and the country traversed by the new Welsh Highland Railway is second to none for magnificent mountain, lake and river scenery. The two railways together will give the traveller the most remarkable railway journey in Great Britain. The total length of the Welsh Highland Railway will be about 25 miles, that of the Festiniog Railway being 13 miles.

The same Board of Directors also control the Snowdon Mountain Tramroad which, as is well known, runs from Llanberis to the summit of Snowdon, and is worked on the Abt rack system. It is intended to work these railways in conjunction with the various motor coach organisations in North Wales, and to arrange combined tours by rail and road through the whole of Snowdonia. The Welsh Highland Railway and the Festiniog Railway connect with the Great Western Railway at Blaenau Festiniog and Minffordd, and with the London and North Western Railway at Blaenau Festiniog and Dinas Junction. These trunk lines give convenient connections with all parts of the country. In addition to the tourist traffic which should be very heavy during the summer months, it is anticipated that there will be large developments in the slate and granite quarries, many of which have been put out of business by lack of transport, and also that the many metalliferous lodes in the district may be opened out. The engineers for the new railway are Messrs. Sir Douglas Fox and Partners, and the contractors Sir Robert McAlpine and Sons.

A Winter Rendezvous for Railwayists.

AMONG all business organisations, the railway is perhaps unique in the vast diversity of interests that it covers; mechanical engineering, civil engineering, electrical engineering, traffic operation, signalling, economics, each branch in itself providing a wide field of study with a hundred and one ramifications and diversities of individual method and practice, together contribute their quota to the fascination of the vast and complex organism that we call the railway. Small wonder is it, then, that railway votaries or "railwayists" abound, of a keenness proportionate to the unlimited scope of their hobby; and, further, that they rejoice to foregather, whenever and wherever possible, in order to discuss it in all its bearings.

It is for railway enthusiasts of this character, no less than for members of railway staffs, numbers of whom it has drawn within its orbit, that the Railway Club has been designed. Founded in 1899, it has risen from small beginnings to the dignity of its own club premises, situated conveniently at Leplay House, 65, Belgrave Road, S.W. 1, within five minutes' walk of Victoria station. These premises consist of a comfortably-furnished club room, which also houses the library, and the use of another room of ample accommodation in which are held the monthly meetings. It is pertinent to add that the Railway Club is the only railway society of any kind in the country which possesses its own club room and library, accessible to members at all hours of the day, either as a *rendezvous* or for purposes of reading or study. The library itself is one of the finest railway collections extant, comprising technical and historical works, railway maps, working and public time-tables going back over a long period, &c., and in addition,

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all the chief weekly, monthly and annual railway periodicals are provided.

Monthly meetings of the club are held on the second Friday in each month, an announcement of which appears in the previous issue of the RAILWAY MAGAZINE; at these meetings papers on railway subjects are read by members and others, frequently illustrated by lantern slides, photographs or diagrams, and are subsequently discussed. Both papers and discussions reach a high level of merit, and reveal a close and detailed acquaintance with the subjects in hand. It is also hoped that, during the coming winter the facilities afforded by the club to collectors of railway photographs, tickets, &c., for getting into touch with each other, may be used to organise informal exhibitions of these collections. Provided sufficient support is forthcoming, it may be practicable similarly to arrange impromptu debates on railway topics on other than the monthly meeting nights. During the summer time, by courtesy of the railway and other authorities concerned, visits are paid on Saturdays to locomotive works, running sheds, power stations, and other places of railway interest. And, finally, as regards arrangements, the annual dinner is a festivity which, for many years past, has been held during the month of December, and provides a pleasant opportunity for social intercourse.

In order to encourage an influx of young and keen members into the club, a decision has been reached recently to form a new class entitled "Junior Members," between the ages of 17 and 21 inclusive. These will be required to pay an annual subscription of one guinea only, and an entrance fee of 5s. These are one-half the amounts charged to ordinary members, which are two guineas and half-a-guinea respectively. It may be added that all subscriptions are payable, if desired, in half-yearly instalments, on January 1 and July 1; new members joining at the present time, and paying an annual subscription down, have the additional privilege of being covered until the end of 1923. The Hon. Sec. will be pleased to forward forms of application to any desirous of membership, on hearing from them to that effect. Under the Presidency of Mr. Cecil J. Allen, A.M.Inst.T., A.I.Loco.E., whose contributions to these pages are now widely known, the Railway Club is looking forward to a successful winter season, and intending participants should lose no time in making their applications for membership.

The Brandling Junction Railway.

IN view of remarks published in the September RAILWAY MAGAZINE under the heading "Robinson's Railway Timetable, 1841," Mr. G. H. Bartram, of Sunderland, writes as follows:—

"'Brandling' is quite a well-known name in Wearside and Tyneside, being found in many street and road names, &c., particularly in those near the old Brandling railway. This line took its name from a Mr. Brandling, who was the promoter of the railway, and the Gateshead-Sunderland, and South Shields lines were opened, I think, in 1834 or 1835, the Sunderland terminus being at Monkwearmouth, and the Gateshead station at Redheugh. I was interested to learn that the Brandling Junction Railway ran trains to Durham; I had always the impression that the Newcastle and Darlington Junction constructed the line from Darlington to Gateshead, taking it from Ferryhill through Leamside to join the B.J.R. at Brockley Whins, in order to avoid Durham (which city had a dislike to railways), and that the Durham branch from near Leamside was constructed at a later date. However, it appears that the B.J.R. had had a line to Durham for some years when the N. and D.J.R. was opened in 1845. I suppose the latter joined the B.J.R. at Belmont (where there was, I think, a station), South of Leamside (the Rainton mentioned in the guide), and the original Durham branch continued from that point to Gilesgate station: both branch and station are now used for goods only. I have seen it recorded in a local history that the Sunderland to Durham Railway was opened in 1836, but I understand that the line from Penshaw to Sunderland via Hylton was not opened till 1851, so probably 1836 marks the opening of the B.J.R. from Brockley Whins to Durham. The Boldon station your correspondent mentions is, of course, not the present East Boldon station (then known as Cleadon Lane); where the present Washington and Tyne Dock mineral line crosses the Newcastle-Sunderland road is a signal-box called 'Boldon Station,' but this point is quite off the present Washington-Pelaw line, and the further fact that Brockley Whins is a farm about ¼-mile from the present station of that name suggests that Brockley Whins station has always been where it now stands, and that it was then (1841) a three-way junction, Durham trains using the spur, still in existence, and South Shields trains a spur, long since removed, but generally corresponding with a line towards Tyne Dock built at some later date, necessitating the displacement of the down platform at Brockley Whins towards the east. Whether the spur from East Boldon Junction signal-box was then built and used by passenger trains, I do not know; two of these spurs are single line, the first-mentioned running

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at one point over a high wooden trestle bridge, still standing. Incidentally, mounted on the present Felling station buildings, is the wooden gable-end of a building bearing the initials 'B.R.' and the arms of the company, this relic being apparently taken from the old station, the down platform of which still exists in general outline; the original B.R. lines between Gateshead and Pelaw are now used only for goods traffic; and passenger trains run over the widened lines subsequently laid down."

Boy Scouts at Alexandra Palace.

On Saturday, October 7, some 60,000 Boy Scouts and Cubs from all over England, with parties from Scotland and Wales, assembled at the Alexandra Palace to give a Posse of Welcome to H.R.H. the Prince of Wales. In addition, many thousands of the general public attended, so that the railways concerned had to deal with traffic on a very large scale, including the running of several special long-distance trains, the conveyance of large numbers of parties travelling by ordinary main line trains, and the provision of almost continuous local services, together with through trains from and to other companies' lines. From particulars furnished by Mr. C. J. Selway, C.B.E., Superintendent of the Line, Great Northern Railway, and Colonel H. H. Mauldin, Superintendent of Operation, Great Eastern Railway, these arrangements represented no light undertaking. The Great Northern Railway, naturally, had to bear the chief burden. Advantage was taken of the fact that two stations were available, on distinct routes, to confine virtually all the London traffic to Alexandra Palace station, Wood Green being used for traffic by main line trains. Some 40 specials were dealt with at Wood Green station and 12 at Alexandra Palace, in addition to numerous ordinary trains. Special trains were received from the southern railways via Ludgate Hill and the Metropolitan Railway, from the Great Western and London and North Western Railways via the North London Railway, and trains from various parts of the Great Northern system, and from Scotland and Wales; also from the Great Central and Midland Railways. Arrangements were also made so that long-distance Scouts could have a few hours in London, while several ordinary main line trains called specially at Wood Green. On the Great Eastern Railway there were specials from Norwich, Yarmouth, Ipswich, Cambridge, Bury St. Edmunds and Southend, and from various parts of the suburban district, over 11,000 arriving passengers by these and numerous additional local trains being dealt with at Palace Gates station.

Reductions in Railway Fares.

As we go to press it is announced that, commencing January 1, 1923, the second increase, of 25 per cent., on pre-war passenger fares is to be removed, reducing them to 50 per cent. over pre-war charges. Also that first-class fares are to be charged at 2½d. per mile. This will affect many special fare facilities offered by the railway companies. In some irresponsible quarters it has been assumed that the railway companies have unfairly maintained the present fares, and that a reduction should have been made at an earlier date. As, however, these assumptions ignore two important facts (1) that the railway companies have introduced passenger travel concessions on a wide basis and (2) that only recently a reduction in freight rates, affecting a large revenue, was made, they are seen to be entirely unfounded. As a matter of fact, the effect on the revenue of the reduction in freight rates has not been so favourable as to lead the railway companies to rush forward with further concessions. The reduction of fares may, therefore, be taken not as one entirely justified by the existing circumstances, but as a measure adopted in the hope that increased travel will compensate for the passenger traffic revenue sacrificed.

Mr. Charles Aldington, C.B.E.

We regret to record the death, on Sunday, October 15, of Mr. Charles Aldington, C.B.E., who retired last year from the position of General Manager of the Great Western Railway, after holding that office for less than two years, owing to ill-health. Mr. Aldington had previously been Superintendent of the Line and Assistant General Manager, and it is generally recognised that he paid the penalty for very close devotion to duty during the strenuous and difficult war years. The funeral on Wednesday, October 18, was in Cornwall, near Marazion, and was attended by directors and chief officers of the Great Western Railway, and by representatives of other companies, a memorial service being held simultaneously at St. James' Church, Paddington.

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MR. JAMES PEPPER, Assistant Goods Manager, Midland Railway, who has been appointed as from October 1, Manager and Secretary of the Midland Railway (Northern Counties Committee) in Ireland, is 46 years of age. Mr. Pepper commenced his railway career at a small station on the Furness line. Subsequently he joined the staff of the London and North Western Railway and later transferred to the Lancashire, Derbyshire and East Coast Railway. Mr. Pepper then went into the service of a private firm for five years, but in 1908 returned to the railway by entering the Midland Chief Goods Manager's office at Derby, where he was chiefly engaged in connection with the reorganisation of goods terminal arrangements. In this important work Mr. Pepper had long taken a special interest, and when in 1916, he was appointed London Outdoor Goods Manager, and, 18 months later, London District Goods Manager, he found opportunity for the initiation and development of the highly-effective system of cartage control in London and district. In March, 1919, Mr. Pepper was promoted to the position of Assistant Goods Manager at the company's headquarters, Derby.

Elliott] **MR. J. PEPPER,** *[G Fry.*

Manager and Secretary,
Midland Railway (Northern Counties Committee), Ireland.

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MR. JAMES COWIE, who retired on September 30, from the position of Secretary and Manager to the Northern Counties Committee, Midland Railway, Ireland, entered the service of the late Belfast and Northern Counties Railway in the General Manager's office in 1869. In 1885, after experience in various departments, he was appointed Assistant to Mr. E. J. Cotton, then General Manager. On the death of Mr. Cotton in 1899 he succeeded him as Manager. In 1905, on the retirement of Mr. Gill, then Secretary, Mr. Cowie was appointed Secretary and Manager. From July 1, 1903, the Belfast and Northern Counties Railway was taken over by the Midland Railway, and its affairs have since been conducted by a Committee of Management sitting at Belfast and known as "The Northern Counties Committee." Mr. Cowie has been associated with many important occurrences and developments in connection with Irish railways, and gave evidence before the Vice-Regal Commission on Irish Railways, 1906–1909, while he was a member of the Irish Railway Executive Committee during the period of Government control of Irish Railways. He also gave evidence on behalf of the Northern Irish Railway Companies in connection with the recent inquiry by the Northern Parliament into the working of the Northern Irish Railways. He was Chairman of the Irish Railway Managers' Conferences in 1912 and again in 1919.

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MR. BOWMAN MALCOLM'S retirement from the position of Chief Engineer and Locomo-

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MR. J. COWIE,

Secretary and Manager,
Midland Railway (Northern Counties Committee), Ireland,
who retired on September 30.

tive Superintendent of the Midland Railway lines in Ireland administered by the Northern Counties Committee has terminated an exceptionally lengthy career as a chief officer, he having been appointed Locomotive Engineer of the Belfast and Northern Counties Railway in 1876 at the age of 22. He joined the locomotive department as a pupil in 1870, so that he has had over 52 years' service. In 1903, when the Belfast and Northern Counties Railway was taken over by the Midland Railway, Mr. Malcolm remained in charge of the locomotive department, and in 1906 he also was appointed Chief Engineer, becoming at the same time Civil Engineer of the County Donegal Joint Committee's Railways, of which the Midland is part owner through the Northern Counties Committee. Mr. Malcolm has been responsible for a number of locomotive designs,

MR. BOWMAN MALCOLM,

Chief Engineer and Locomotive Superintendent,
Midland Railway (Northern Counties Committee), Ireland,
who retired on September 30.

MR. W. K. WALLACE,

Engineer and Locomotive Superintendent,
Midland Railway (Northern Counties Committee), Ireland.

both for the 5 ft. 3 in. and 3 ft. gauges, an outstanding feature of his practice being the adoption of the two-cylinder compound principle, contemporaneously with the corresponding practice of Mr. T. W. Worsdell, first on the Great Eastern and then on the North Eastern Railway. It is worthy of note that, almost alone in British locomotive engineering, Mr. Malcolm has adhered to his belief in the efficiency of the compound locomotive engine, though he was to some extent assisted by the fact that his broad-gauge inside-cylinder engines ran on the 5 ft. 3 in. gauge, which made it easier to accommodate a high-pressure and a large low-pressure cylinder between the frames, while his narrow-gauge engines have outside

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cylinders. It is to be remarked also that Mr. Malcolm utilised the Walschaerts valve gear for his engines, in which respect his practice was for a long period unique in British locomotive engineering, especially for inside cylinder engines. Under the Midland Railway, since 1903, the designs used by Mr. Malcolm have been continued, and a few main line engines have been built at Derby to his designs, these being, it is believed, the last two-cylinder compound locomotives to be built for a British railway, while the Northern Counties' system is the only one upon which such locomotives are still systematically employed. As Chief Engineer, Mr. Malcolm has carried out a number of important works, including a new single-leaf bascule bridge of the Strauss type over the River Bann, at Coleraine, on the Belfast-Londonderry line. Now almost completed, the bridge is remarkable in that it has nine fixed spans of 75 ft., one fixed span of 20 ft., and one bascule span of 85 ft., the total length between bearings being approximately 100 ft.

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MR. WILLIAM KELLY WALLACE, who has been appointed Engineer and Locomotive Superintendent of the Northern Counties Section of the Midland Railway in Ireland, in succession to Mr. B. Malcolm, entered the service of the Belfast and Northern Counties Railway in 1900 as a pupil of the late Mr. B. D. Wise, M.I.C.E. Under Mr. Malcolm he has had wide experience, particularly on the civil engineering side. He had charge of the construction of the bridge over the River Bann and the deviation of the Midland Railway (Northern Counties Committee) main line authorised by the Midland Company's Act of 1914.

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MR. FRANCIS G. HOPKIRK, who has retired from the position of Assistant Engineer to the Northern Counties section of the Midland Railway in Ireland, entered the service of the Belfast Northern Counties Railway in 1880 in the Engineering Department. Mr. Hopkirk is a member of the Institution of Civil Engineers.

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MR. ALEXANDER ELLIS, who retires from the position of Stores Superintendent of the Midland Railway (N.C.C.) as from the end of October, first became connected with the Northern Counties line about 1870, and gained a widely-varied experience before taking up the duties he has successfully discharged in the stores department for the past 33 years. As a youth he did station work at Larne and at other stations, after which he was transferred to the General Manager's office, where he passed through the several departments, until he became Claims Clerk, a position he held for some three years, and was eventually placed in charge of the stores department.

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LORD CLAUD HAMILTON, Chairman of the Great Eastern Railway Company, has intimated his intention to retire from the board at an early date. Lord Claud joined the directorate as long ago as 1871.

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SIR GEORGE BEHARRELL, D.S.O., has resigned from his position as Director-General, Finance and Statistics Department, Ministry of Transport, and has taken up an important appointment with the Dunlop Rubber Company, Limited.

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MR. A. W. BOLDEN, Managing Director of the Antofagasta (Chile) and Bolivia Railway, left Southampton on October 6 for South America. His journey is through Buenos Ayres and thence via the Transandine route to Chile and Bolivia where he will discuss railway affairs with the local managers. Mr. Bolden, in addition, proposes to visit the Nitrate Railways of Iquique, of which also he is a director.

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MR. WILLIAM HENRY BROWN, J.P., Secretary of the Metropolitan Railway Company, has just completed 50 years' service with that company. After occupying a number of responsible positions, Mr. Brown—who is a Justice of the Peace for Middlesex—received his present appointment as Secretary in 1908. Mr. Brown's portrait appeared on page 170 of the September RAILWAY MAGAZINE.

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MR. JOHN DICKIE, Inspector in the Glasgow and South Western Railway General Manager's Department at St. Enoch Station, Glasgow, was the recipient of handsome presents from the staff attached to the General Manager's Office on the occasion of his retiral from the service of the company, the presentation taking place in St. Enoch Station Hotel. Mr. Downes, the General Manager's Assistant, who presided, and Mr. Johnstone who presented the gifts on behalf of the staff, and also other members of the staff associated with Mr. Dickie, paid tribute to his outstanding abilities and faithful service extending over a period of 51 years, 35 of which he occupied important positions at the headquarters in Glasgow. Mr. Dickie joined the service at Dumfries in April, 1871.

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MR. JOHN KENNETH FOSTER, one of the company's directors, presided at the annual dinner and concert of the Great Eastern Railway Amateur Athletic Association, held on October 7, at the Hamilton Hall, Great Eastern Railway Hotel, Liverpool Street, E.C. Over 300 persons were present. Colonel William Johnson Galloway, another member of the board, occupied the vice-chair. In the after-dinner speeches, mention was made of the loss the company was sustaining in the departure of Sir Henry Thornton and the coming resignation of Lord Claud Hamilton. As regards the Athletic Association, praise and thanks were accorded Mr. George Rudland, hon. general secretary, Mr. S. W. Frost, hon. assistant secretary, and Mr. W. C. Hansell, hon. financial secretary.

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BY the courtesy of the London and South Western Railway, 19 members of the London School of Economics Railway Students' Association visited Feltham Marshalling Yard on Saturday, October 7.

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IT is hoped that the North Eastern Railway War Memorial at York will be completed by June, 1923. The question of a suitable site having been settled, the erection can now proceed. Sir Edwin Lutyens is the architect.

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A VERY attractive programme of short papers and debates has been arranged for 1922–23 session by the York Railway Lecture and Debating Society. The meetings are held on Tuesday evenings in the large hall of the Railway Institute, York.

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IN aid of the Hospitals of London Combined Appeal, three fine performances of the well-known comic opera "The Mikado" were given during the second week in October, at the King's Hall, Covent Garden, by the Dramatic and Operatic Section of the T.O.T. Philharmonic Society, recruited almost exclusively from the London Underground Electric Railways and associated companies' staffs.

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THE final competitions for the 1922 season were held by the Great North of Scotland Railway Head Office Golf Club at Cruden Bay. Sixteen players who had qualified to compete for the Davidson Cup, presented by the General Manager, played two rounds of the 18-hole course. The trophy was won by Mr. C. G. Cruden, Mr. N. L. Kidd being runner-up, while the third prize was won by Mr. G. Philip. The officers of the company also provided prizes for a bogey competition open to all members, and Mr. Cruden also carried off the first prize here, Mr. J. G. Singer being second, and Mr. Cruickshank third. Mr. Singer's prize for the best scratch score for the 18-hole course was carried off by Mr. Cruden, who also secured a prize presented by Mr. J. M'Andrew, the professional. The captain's prize was won by Mr. T. Reid. After the contest the members of the club all met in the Cruden Bay Hotel, the company being presided over by Mr. George Davidson, the General Manager, who was accompanied by Mrs. Davidson. There were also present Miss Williamson, Manageress, Cruden Bay Hotel; Mr. G. P. Benzie, Stores Superintendent; Mr. Wm. Johnston, Superintendent of the Line; Mr. T. S. Mackintosh, Secretary; Mr. A. A. Ryan, Hotel Manager; and Mr. S. R. Willox, Goods Manager. Apologies for absence were intimated from Mr. H. Laird, Accountant, and Mr. J. A. Parker, Engineer. Mrs. Davidson presented the prizes.

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ARISING from a suggestion by Mr. George Wilson, Assistant Stationmaster at York, a Railwaymen's Sunday was held in York Minster on September 30. A congregation of fully 6,000 assembled from all parts of the North Eastern Railway system. The Archbishop of York preached the sermon, and a collection was taken in aid of the National Union of Railwaymen's Widows' and Orphans' Fund. Among those present were the following chief officers of the North Eastern Railway:—Mr. R. L. Wedgwood, General Manager; Major H. A. Watson, C.B.E., General Superintendent; Sir Francis Dunnell, K.C.B., Solicitor and Secretary; Sir Vincent L. Raven, K.B.E., Chief Mechanical Engineer; Mr. C. F. Bengough, Chief Engineer; and Mr. E. T. Barrell, Chief of Police. The service was preceded by a procession from York station to the Minster, headed by the N.U.R. Silver Band.

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ON Michaelmas Day the Metropolitan Graduate and Student Society of the Institute of Transport held their annual Bohemian concert in the Cambridge Room, Liverpool Street Station Hotel. Sir Henry Thornton, K.B.E., General Manager, Great Eastern Railway, had intimated his intention of taking the chair, but, owing to his sudden departure for America, Mr. C. J. Selway, C.B.E., Superintendent of the Line, Great Northern Railway, deputised in his stead. Supporting him were Mr. J. P. Thomas, Operating Manager, London Underground Railways; Mr. J. Thornton, Superintendent

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of the Line, London Underground Railways; Mr. S. J. Webb, Chief Passenger Agent and Fares Officer, London Underground Railways; Mr. Phillip Burtt, formerly Deputy General Manager, North Eastern Railway, and Mr. F. W. Wheddon, Chairman, Graduate and Student Society.

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AT the recent ordinary half-yearly general meeting of the Dublin and Kingstown Railway, Mr. Charles J. Reddy urged the formation of some scheme for the protection of railways throughout Ireland. The public, he said, should be brought to realise that such destruction fell upon their own shoulders, and not upon the shoulders of the Government. The policy of destruction was destroying their trade and commerce, and inflicting untold loss on the middle-class people, who existed upon the income of the railways.

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AFTER a lapse of 11 years, a revival of the annual sports of the Manchester goods department, C.A. Division, London and North Western Railway, took place at Belle Vue, Manchester, in September. There were over 300 entries; Mr. F. P. Kinsman, District Goods Manager, his assistants Messrs. G. O. Humphreys and A. H. Myers and several members of his personal staff acted as judges. At the conclusion Mr. Richardson, London Road Agent, and Chairman of the Sports Committee, thanked all who had assisted.

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AT the third annual general meeting of the Institute of Transport held at the Institution of Electrical Engineers on October 2, the report of the Council and statement of accounts for the year 1921–22 was adopted, the auditors were re-elected and an announcement was made of the officers and council for the year 1922–23. The following premium awards for papers submitted during the past year were then made by the President, Sir Henry P. Maybury:—

Railway (*Operating*) *Gold Medal*: Mr. J. P. Thomas, for paper on "The Operation and Development of Urban Electric Railway Services." *Railway* (*Engineering*) *Gold Medal*: Colonel J. W. Pringle, C.B., for paper on "'Safety' in Railway Operation." *Road Transport Gold Medal*: Sir J. E. Thornycroft, K.B.E., for paper on "The future design of road vehicles for passenger and goods services." *Road Transport* (*Passenger*) *Gold Medal*: Mr. Frank Pick, for paper on "The Operation of an omnibus company with reference to capacity and cost under given conditions." *Water Transport Gold Medal*: Mr. Meredith Salt, for paper on "Water transport—coastwise shipping of the United Kingdom." *Institute Silver* (*Graduate*) *Medal*: Mr. A. K. Dalton, for paper on "Tramway rolling-stock—a short review of the development of the tramcar." *Institute Silver* (*Student*) *Medal*: Mr. Gerald Yorke, for paper on "The factor of speed in the handling of passenger traffic." "*Modern Transport*" *Premium*: Mr. William Frederick Steel, for paper on "Tomato traffic—Guernsey to Southampton Docks."

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SIR HENRY MAYBURY then made a presentation to Mr. H. E. Blain, C.B.E., Honorary Secretary, on behalf of the members in recognition of his valuable services to the Institute. The testimonial took the form of a gold cigar case, suitably inscribed, and a number of water colours. In a pleasing speech, Sir Henry Maybury expressed the feeling of the members for the work of the Honorary Secretary, and Mr. Blain suitably responded. Sir Sam Fay was then installed as President of the Institute for the ensuing year, and, subsequently, he presented presidential mementoes to Lord Ashfield and Sir Henry Maybury. In doing so, he mentioned that Sir Eric Geddes could not attend that evening to receive his memento, but would attend at the next meeting for that purpose. Sir Sam Fay then delivered his presidential address, referred to elsewhere. A vote of thanks to Sir Henry Maybury for his services as President and to Sir Sam Fay for his excellent address, was proposed by Sir W. Joynson Hicks, M.P., seconded by Mr. E. S. Shrapnell Smith, C.B.E.

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FOR the current session the Great Western Railway (London) Lecture and Debating Society has an attractive programme. Illustrated by lantern slides will be lectures by Sir Vincent Raven, K.B.E., Chief Mechanical Engineer, North Eastern Railway, on "Advantages of Electric Traction" (January 4, 1923); and by various officers of the Great Western Railway on "Working of Traffic to and from Paddington Station," by Mr. F. R. Potter, London Divisional Superintendent (November 16); "Great Western Railway Docks," by Mr. F. Brown, Commercial Assistant to Chief Docks Manager (January 18); the "Why and Wherefore of Locomotive Design in Relation to Various Traffics," by Mr. F. C. Hall, London Divisional Assistant Locomotive Superintendent (March 1, 1923); and by gentlemen outside the service in regard to topics on which they are recognised authorities. On February 1, 1923, Mr. F. V. Russell, C.B.E., Assistant to General Manager, Great Eastern Railway, will deal with heavy suburban traffic, steam and electri-

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cally-operated. The Hon. Secretary is Mr. L. Williams, of the General Manager's office.

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A WAR memorial in tablet form has been erected by the Belfast and County Down Railway in the circulating area at Belfast station, in honour of those members of the staff who volunteered and served in His Majesty's Forces during the great war. The tablet, which occupies a conspicuous position on the wall immediately adjoining the stationmaster's office, bears the names of 150 of the staff of the company who served. The names are engraved and waxed on a bronze plate, the latter being relieved in cast bronze with the cost of arms of the railway company at the top and mounted on polished Ashburton marble.

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RAILWAY MAGAZINE readers will note with interest that the cover of the London and South Western Railway public time-table book has been changed from brown to green in harmony with the colour scheme lately adopted for the company's passenger rolling-stock.

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IT has been agreed by the railway companies of Great Britain to carry a totally blinded war pensioner, travelling and accompanied by an attendant, at a reduced fare. Tickets will be issued to both persons at the booking office, on production of a Ministry of Pensions certificate, at half-fare rates, no difference being made where the attendant is a child under 12 years of age. The concession applies to season as well as ordinary tickets.

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FROM November 1, the charges for cloakroom facilities for commercial travellers in Great Britain, will be reduced from 3d. to 2d. per package. To prevent the abuse of the privilege, persons claiming it will be required to produce credentials.

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A DECISION has been issued by the Electricity Commissioners refusing permission to the South Eastern and Chatham Railway to build a separate generating station in connection with its electrification scheme. No suitable outside supply is actually in being, but the Commissioners state that they are satisfied such a supply may be made available by the time it is wanted. Both the London, Brighton and South Coast and the North Eastern Railways' representatives gave evidence at the inquiry that their experience of power supplied from outside was satisfactory.

IN the Southern Irish Chancery Division, in the matter of the Companies Act, 1867, and the Listowel and Ballybunion Railway, recent application was made in respect of the debenture holders' action brought in England, for directions as to the steps to be taken under circumstances which had rendered the continuance of the undertaking as a working concern a matter of the greatest possible difficulty. Mr. Thomas C. Moore, it was explained, had been appointed manager and receiver for the line many years ago, and he had been carrying on the undertaking under the Court for some time, there being really no company. It was a mono-rail line, between Listowel and Ballybunion, Co. Kerry, and the small profits made on the undertaking were sent over every year to England for the benefit of the debenture holders. Owing to the state of things existing in Ireland, the line had been entirely cut off from outside communication, and it had been closed down. Mr. Chadwick, who made the application, further stated that information had been received that morning from the Department of the Minister of Transport to the effect that the line had been reopened, and was now carrying on. Mr. Crawley had not been aware of that when the summons was taken out, and under these circumstances he could not ask the Court for any order at present.

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SUBJECT to the approval of the proprietors and debenture stockholders the Isle of Wight Central Railway has entered into a provisional agreement with the London & South Western Railway for the absorption of the island railway by the latter company as from January 1, 1923.

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PASSIMETERS on the London Underground Railways have come to stay. Following the installation of an experimental one at Kilburn Park some months back, which has proved a great success, passimeters have been put in at other stations, *viz.*, Broad Street (Central London Railway), Maida Vale, Warwick Avenue, Paddington, Earl's Court, Stepney Green, Wood Lane, West Brompton, Trafalgar Square and Hammersmith (Church Lane). Passimeters will also be introduced on the reconstructed City and South London Railway stations, and on the new extension line from Golders Green to Edgware. Since the introduction of the first passimeter, further experiments have been made to simplify and expedite the booking of tickets. The latest device is a change-giving machine, an improved type of which is being specially made for the Underground Company. A

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passenger, for example, tenders half-a-crown for a fourpenny ride. A button is pressed, and the ticket is delivered to the passenger through a slot. At the same time the half-crown has been inserted in the change-giving machine, and two shillings and twopence is delivered into a small trough immediately in front of the passenger. The machine indicates clearly to the passenger and booking clerk the precise amount of change which has been delivered. As 70 per cent. of the Underground passengers require change, the advantages of a quick change-giving machine are obvious. An efficient machine of the type described will, it is expected, increase the rate of booking from 12 tickets per minute to 20.

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AT Broad Street (Central London Railway) a special electrical lock has also been fitted to the passimeter to operate the turnstiles. This is worked by a foot plunger instead of the ordinary foot lever. This is the first time an electrical lock of this type has been fitted to a passimeter, and its operation is bound to be more precise. The passimeter system enables the daily number of passengers passing in and out of a station to be recorded, including season ticket holders. This permits of comparison being made in the day to day fluctuations in traffic. The season ticket holders are registered upon a special cyclometer, whilst the total number of passengers are registered upon the passimeter. No regular count of season-ticket holders was possible under the old system.

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ONE way of establishing a brighter London is the inauguration of brighter cars on the electric railways. The Underground have felt for some time that the new all-steel rolling-stock on the District Railway could be materially improved in general comfort if more careful consideration were given to the general internal appearance. Whilst these cars left nothing to be desired as regards safety, comfort, design and facilities for quick loading and unloading, it was felt that the all-steel construction of the cars produced a corresponding "all steel" atmosphere. Steps have therefore been taken to brighten up the cars. Mr. Hall Thorpe, the well-known artist has been commissioned by the Underground Company to plan pleasing and harmonious colour schemes, and several cars have now been dealt with. Some are in grey relieved with yellow, and are fitted with brown and gold moquette cushions. Some are in blue relieved with white, and fitted with brown plush cushions in the first-class compartments, and with brown and gold moquette cushions in the third class. Others are in green relieved with two shades of grey, the cushions being brown and green plush. All seats are fitted with arm rests, and are 2 in. wider. The floors are being made more ornamental by the introduction of a kind of foot rest. Upright rods from floor to ceiling have been dispensed with in favour of straps, and the handles of the doors have been nickelled. Ventilators in the first-class compartments have also been improved. These can now be regulated by the passengers instead of being fixed as formerly. Turning to the outside of the cars, these have been painted a deep brown, and the familiar Underground symbol "London's Underground" appears on the side. One of the cars has been equipped with the noise eliminating devices, which are the outcome of experiments made by Professor A. M. Low.

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IN the Great Northern Railway autumn and winter time-table, from Monday, October 2, many of the improvements in the train service instituted for the summer months are retained. The service between King's Cross and the manufacturing towns in the West Riding of Yorkshire remains unaltered except that the 5.45 p.m. dining car express from King's Cross starts at 5.40 p.m. and an additional service to King's Cross is given by the 10.10 p.m. from York and 10.23 p.m. from Leeds, arriving at 3.25 a.m. Through restaurant car trains continue to leave King's Cross for Harrogate at 7.15 a.m. and 1.40 p.m. and Harrogate for King's Cross at 11.20 a.m. and 2.30 p.m. The 7.30 p.m. sleeping car express from King's Cross to Scotland (Saturdays excepted), continues to be provided with dining car accommodation as far as Grantham, a convenience which has been much appreciated since it was instituted in July last. This train does not run on Sunday nights. The 10.20 a.m. luncheon car express from Newcastle is due King's Cross 4.30 p.m., an acceleration of 35 min. as compared with last winter. A new and accelerated service for the winter months from the Highlands is given by the 1.30 p.m. train from Edinburgh to King's Cross, being timed 10 min. later and affording connections with trains leaving Inverness 8.40 a.m., Aberdeen 9.50 a.m., and Perth 12.15 p.m. A through carriage to Hertford is attached to the 5.10 p.m. train from King's Cross and one for Lincoln to the 5.40 p.m. dining car express.

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WHEN the train services of the London, Brighton and South Coast Railway were revised on and from October 2, it was found that very few of the fast and improved services introduced for the summer had been disturbed. A useful feature was the extension of the rail motor services which provides

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additional facilities between Brighton and Tunbridge Wells; Eastbourne and Tunbridge Wells; and Red Hill and Horsham. Certain motor trains running between Eastbourne and St. Leonards have been extended to Hastings. On Sundays, first and third-class Pullman cars run to Worthing in the 10.30 a.m. train from Victoria, by which is issued a special return inclusive ticket at 27s. and 13s. 6d. respectively. From October 8, the third-class Pullman Limited train on Sundays has made an additional journey between Victoria and Brighton—the departure from Victoria is 9.45 a.m. and 4.55 p.m. and from Brighton, 11.30 a.m. and 6.35 p.m. The "Sunny South Special" between Eastbourne, Brighton, Birmingham, Manchester, Liverpool, &c., also the through train from Brighton to Bournemouth, Salisbury, Ilfracombe, Bath, Bristol, Cardiff, &c., will be maintained every week-day during the winter months.

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IN the Brighton Railway's suburban area, a new train is run from Anerley to London Bridge at 8.21 a.m. The 12.52 p.m. (Saturdays only), London Bridge to Cheam, runs on to Dorking and the 1.45 p.m. (Saturdays only) Victoria to Sutton is extended to Cheam. During the winter, cheap tickets will be issued every Wednesday to London from South Coast and country stations; Brighton passengers will have in addition cheap facilities to London on Thursdays.

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COMMENCING Monday, October 30, London and North Western Railway electric trains in the London suburban area work also to Croxley Green, served hitherto by steam motor trains from and to Watford Junction. Electric trains provide a frequent shuttle service, while several through trains are operated between Croxley Green and Euston or Broad Street at busy hours.

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A SCHEME for the reconstruction of the Farringdon and High Holborn station of the Metropolitan Railway has been approved, entailing the complete transformation of the present station which was opened for traffic when the railway was constructed between Bishop's Road and Farringdon Street nearly 60 years ago. Farringdon and High Holborn station is one of the most important on the system. Through it pass each day approximately 1,200 trains, whilst no fewer than 60,000 passengers here entrain and detrain daily. The station will comprise two distinct floors, the lower consisting of a complete range of shops, booking offices, parcel offices, cloak rooms, buffets, &c., whilst the whole of the upper floor will be laid out as an up-to-date restaurant capable of accommodating, in comfort, over 100 persons.

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THE new speed-up of the London Underground which took effect on October 2, demonstrated in a remarkable way the easing of the traffic pressure during the rush hours. The crowds at Piccadilly, Oxford Circus and Charing Cross, seemed to disperse in half the time. The staff report that the working of the rush hour traffic has been much simplified. The Underground are to-day operating considerably over 4,000 trains per day. The figures are made up as follows:—

Hampstead and Highgate line	992	trains.
District Railway	847	,,
Central London line ..	815	,,
Bakerloo line	758	,,
Piccadilly line	712	,,

* * *

A CONTRACT has been placed by the London Underground Electric Railways for the construction of a new line between Edgware (Church Lane) and a point north of Queen's Road, Hendon, where a connection will be made with the line now being constructed between this latter point and Golders Green. The amount of the new contract is £258,468, and provides for the construction of permanent-way, steel super-structures and bridges, electrical equipment, signalling, station buildings, &c. There will be stations at Colindale, Burnt Oak and Edgware. The length of the new piece of line will be 3 miles. The work is scheduled to be completed before the end of 1923.

* * *

IN an experimental train running on the Piccadilly line, 48 ft. of door space was provided as against 20 ft. in the ordinary train. Twice the number of doorways, 4 ft. 6 in. wide, were fitted as against 3 ft. on the ordinary trains, and the working has been so successful that two further trains are being put in service and the older type is to be converted.

* * *

MR. F. HEWITT, of Liverpool, mentions that since the amalgamation of the Lancashire and Yorkshire and London and North Western Railways several noteworthy changes in train working have occurred. Thus, he states that the Edge Hill-Southport trains conveying through carriages from Euston, and worked for many years by an Edge Hill locomotive stabled at Southport (Lancashire and Yorkshire Rail-

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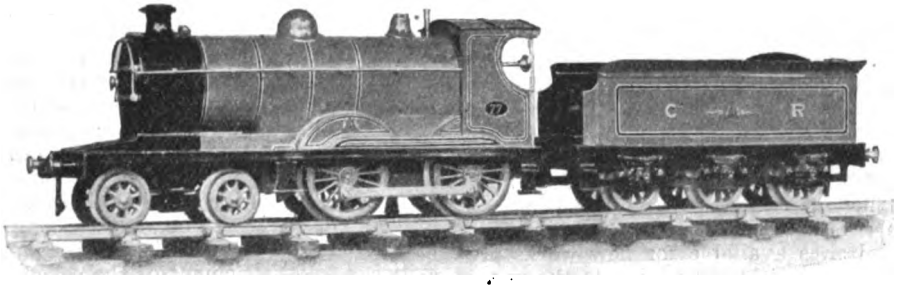
way) is now regularly worked by a " Division B " steam 4–4–0 locomotive from Southport shed. The Edge Hill men who worked this " link " resided at Southport but have now been transferred to Southport shed. They still work the turn, however, though strangers occasionally appear. Mr. Hewitt remarks that at times the Edge Hill district assumes quite a cosmopolitan appearance. Besides " Division B " engines from Southport there are also regular goods workings from Aintree to Edge Hill via Bootle Junction, by the North Staffordshire Railway from Nottingham and Burton, with excursions from the Potteries in the summer months, and by the Cheshire Lines (Great Central Railway engines) from Halewood to Wavertree Road. There is also a North London 4–4–0 tank engine, No. 48, stationed at Edge Hill shed, whilst a local " set " is composed of North London close coupled four-wheelers, repainted in London and North Western Railway colours, with a North Western six-wheeled brake-compo at each end, the set of 12 vehicles being designated " Liverpool Special Set No. 3."

a number of novelties to announce, but perhaps one of the most important lines is the new gauge O model of a Caledonian Railway 4-4-0 type locomotive, No. 77. The firm have produced this model especially in connection with their Edinburgh branch where there is, of course, a keen demand for models of Scottish locomotives. All the same, we think the firm will find that model owners south of the Tweed will not be unmindful of its merits. The model, which is illustrated on this page, is built to a scale of 7 mm. to the foot, 1¼-in. gauge and is fitted with the Bassett-Lowke standard spring motor mechanism with a reverser started from track or cab. Other new lines particulars of which will appear in the firm's Section " A " Catalogue, to be published early in November, post free, 1s. 6d., will include a miniature table railway, which is the smallest clock-work railway in the world, and is complete with track, stations, tunnel, etc., and will go on an ordinary small card table. Then there is a new gauge O Great Western Railway clock-work locomotive, " County of Middlesex." This



A NEW BASSETT-LOWKE MODEL LOCOMOTIVE,

Caledonian Railway, 4-4-0, No. 77.

REFERRING to the appearance of Great Western locomotives at Bournemouth West station, London and South Western Railway, a Bath correspondent states that on the evening of September 9, a return excursion train to Bristol by a Great Western route, presumably via Salisbury, was worked from Bournemouth West station to Bristol by Great Western Railway 4-4-0 locomotive, number 3440. Prior to working this return train, the engine brought in the vehicles for a return excursion by the Midland route, composed of Somerset and Dorset Joint Railway and Midland coaching stock and also destined for Bristol, though by the Midland route.

* * *

As is customary at this season of the year, Messrs. Bassett-Lowke, Limited, makers of engineering models, Northampton, have

engine is fitted with similar movement to the Caledonian locomotive illustrated. The firm are placing on sale a new series of goods vehicles, gauge 1, and a new range of stations, crossing gates, engine sheds, &c. For those who desire scenery for model railways, Messrs. Bassett-Lowke are well prepared, and they have in stock a fine selection of small novelties for users of model railways.

* * *

As frontispiece to the August RAILWAY MAGAZINE, there appeared an illustration of the new 4-6-4 North Eastern Railway electric express locomotive and in the same number, on pages 92–93, a description of the engine was given. At a recent meeting of mechanical engineers, Sir Vincent Raven, Chief Mechanical Engineer of the North Eastern Railway, stated that an experi-

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mental trip had been made with the new engine over the heavy mineral line between Shildon and Newport, on a gradient rising all the way. A train weighing some 460 tons and composed of 17 vehicles was taken up a gradient of 1 in 103 at an average speed of 42 m.p.h., the average drawbar pull at that speed being 6·6 tons. On a grade of 1 in 200 a speed of 58 miles an hour was attained, the drawbar pull then being about 5 tons. The average drawbar pull on the locomotive over the whole gradient, with a very heavy rise from Shildon to Newport of about 400 ft. in a distance of 18 miles, was nearly 5½ tons. Sir Vincent Raven later remarked that he had never been able to produce results like that with a steam locomotive, and it led him to believe from the experimental work already carried out, that when the main line was equipped electrically, the new engine would accomplish everything that was hoped of it. The engine was designed for 1,500 volts, and the electric lines round Newcastle are only installed for 600 volts. Consequently, they were dependent upon this short length of railway on which to make the trials.

* * *

UNDER the title "Industrial Development: A Suggestion by the Eastern Group of Railways," a particularly informing pamphlet is being distributed from York. The booklet includes a very clear map of the Eastern group of railways, and in addition to describing the territory served, it deals with the main industries and subsidiary trades of the districts in question. The principal sites available for new works are described in detail. Of course, in the event of a serious inquiry for the erection of new works, the manufacturer should have an interview with the Goods Manager and Estate Agent of one of the railways concerned, but as a preliminary, a careful study of the book is recommended. Mr. A. G. Stevenson, North Eastern Railway, York, will supply information.

* * *

ALTHOUGH known to RAILWAY MAGAZINE readers mainly as manufacturers of railway electrical equipment, the firm of Metropolitan-Vickers Electrical Company, Limited, Trafford Park, Manchester, have many other activities. We have received from them their Cosmos calendar and lamp showcard, which we note are reproductions of their singularly attractive poster now appearing on the hoardings. From the firm there has come likewise their latest domestic appliance showcard, which is a particularly fine piece of colour printing. Electrical contractors are asked to note that the new season's price lists and folders are available, and Messrs. Metropolitan-Vickers are prepared to overprint the name and address of any electrical firm on a supply of the literature, at the request of the management. The domestic appliances supplied by the firm are in most cases eminently suitable for use in railway hotels and refreshment rooms.

* * *

IN May last the Ministry of Transport published a volume of statistics showing, for selected periods, the total tonnage of a considerable number of important traffics conveyed by rail, the total receipts therefrom, and the receipts per ton per mile for each mile of distance up to 50 miles and for mileage groups beyond that distance. A further volume has been issued and this includes certain additional traffics, namely, drapery, heavy and light; plaster and whiting; provender, and, most important of all, coal, coke and patent fuel, in regard to which separate details are given for home consumption and for shipment traffic. Particulars in regard to hay, clover and straw and to roadstone are also shown in greater detail than in the preceding volume. It is worthy of note that the average length of haul and average receipt per ton per mile in respect of coal, coke and patent fuel for all standard-gauge railways are: for home consumption, 58·58 miles and 1·23d., and for shipment, 22·60 miles and 1·51d. These statistics should be of great value to the trader, the railway companies and the Rates Tribunal in the preparation, criticism and settlement of the schedules of standard charges, which are required, under the provisions of the Railways Act, 1921, to be submitted to the Tribunal by the end of the year, unless some later date is allowed.

* * *

A NEW catalogue of technical and scientific books, new and second-hand, has just been issued by Messrs. W. & G. Foyle, Ltd., 121–125, Charing Cross Road, London, W.C.2. In the railway section no fewer than 58 different railway books are shown in stock, many of them works concerning which RAILWAY MAGAZINE readers frequently inquire. Under the heading of "Steam Engines, Boilers, &c.," the catalogue, which is No. 7, includes over 70 different books. Long lists are given of works on engineering, things electrical, and kindred subjects. By securing a copy of the catalogue readers may be put in the way of obtaining books for which they have long searched in vain.

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UP LIVERPOOL AND BIRKENHEAD EXPRESS, LONDON AND NORTH WESTERN RAILWAY.

4-6-0 Four-cylinder Locomotive, No. 207, "SIR CHARLES CUST."

The above Illustration is the 500th Moving Train Photograph by F. E. Mackay, reproduced in THE RAILWAY MAGAZINE.

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GENERAL VIEW OF VICTORIA STATION, BOMBAY, FROM "A" CABIN.

No. 1 platform to the right.

The Bombay Suburban Services of the Great Indian Peninsula Railway.

By B. D. SULLOCK.

THOUGH Bombay is known as the "Gateway of the East," and is a town containing about 1,250,000 inhabitants, there are only two railways that run out of it, viz., the Bombay, Baroda and Central India Railway and the Great Indian Peninsula Railway. In this article it is proposed to deal with the suburban services of the latter, which are the more important and interesting from a railway point of view.

The suburban area of the Great Indian Peninsula Railway in the Bombay district extends for a distance of 33¼ miles out, as far as Kalyan Junction, where the south-east main line for Poona and Madras leaves the north-east line for Delhi, &c. The following are the stations situated in the suburban area together with their mileage from the Victoria terminus, Bombay:—Masjid, 1; Mazgaon, 1¾; Byculla, 2¾; Chinchpokli, 3¼; Currey Road, 3¾; Parel, 4¾; Dadar, 5½; Matunga, 6½; Sion, 8; Kurla, 9¼; Ghat Kupar, 12¼; Vikhroli, 14¼; Bhandup, 16¾; Mulund, 18½; Thana, 20¾; Parsik, 23¼; Mumbra, 24¾; Diva, 26¼; Dombivli, 29½; Kalyan Junction, 33¼.

There is also the harbour branch from Kurla to Reay Road, with the following stations and distances:—Kolvada, 2¼; Vadala Box, 3¾; Gowari, 3¾; Sewri, 5; Reay Road, 6¾.

From Victoria Terminus to Byculla "A" cabin there are two passenger lines, but between Byculla and Kalyan there are four tracks known as up and down local and through lines. The up and down local lines lie on the down side of the through lines. There are no gradients to speak of, but between Thana and Diva the through lines leave the local lines and cut through the Parsik Hill by means of a tunnel. This line has been temporarily out of use whilst the tunnel, which was opened in 1916, is being lined. It was closed for over two years but has now been reopened. The two original lines between Bombay and Kalyan are now the local lines, the through lines having been opened early in 1915.

There is only one branch line and this

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leaves the main line at Kurla "A" cabin and runs along the north end of Bombay Island to Sewri and Reay Road where for the present it terminates. This is known as the harbour branch. It is intended to extend it to Victoria terminus as soon as the necessary girders for the bridges required can be obtained. This scheme, together with many others for the improvement of the train services of the Great Indian Peninsula Railway, has been much delayed by the great war. The branch is double from Kurla to Vadala Junction, where the Bombay Port Trust Railway commences. From here to Reay Road it is single though it can easily be doubled when required. There are three passenger trains in each direction daily, but there is in addition between Kurla and Vadala a frequent service of goods trains with traffic destined for the Port Trust.

KALYAN PASSENGER TRAIN PASSING "C" CABIN, BOMBAY.

The Great Indian Peninsula Railway run a very good and frequent service of local trains of which some terminate at Kurla, some at Thana, and the remainder at Kalyan. The local services have recently been increased by 20 per cent. and considerably quickened at the same time; 63 local trains leave Victoria Terminus in the course of the day, and 61 arrive, apart from several long distance slow passenger trains which stop at certain stations only in the suburban area.

Each local train set, known as a "rake," consists of eight coaches; one third brake, one first and second composite, one second and third composite, and five third class carriages. It will be noticed how very little accommodation there is for first and second class passengers, but it must be remembered that 99 per cent. of the local passengers travel third class. The coaches are of corridor type with end and central doors opening inwards, and with inter-communicating gangways between the carriages. The first and second class local coaches are plainly but comfortably upholstered; the third class are entirely innocent of upholstery. All doors open inwards, an excellent practice where natives form the majority of the passengers. Nothing delights him so much as to have the door open and to sit on the step with his feet dangling out. The Bombay, Baroda and Central India Railway use compartment coaches with doors that open outwards, and recently one or two accidents have happened from this cause.

Morning and evening trains are filled to their fullest capacity, and to cope with the great increase of the population which is expected in the outer suburban area, a large scheme of electrification for the whole of the suburban district has been prepared and it is expected that work on this will

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shortly commence. Local trains are hauled by both tender and tank engines, the former of the 4–6–0 and 4–4–2 types, and the latter of the 2–6–2 and 0–6–2 types.

Previous to the recent alterations, the 0–6–2 tanks worked the trains which terminated at Kurla, the 2–6–2 tanks those which terminated at Thana, whilst the Kalyan locals were worked by the 4–4–2 tender engines, the 4–6–0 tender locomotives being rarely used on local trains. Now, owing to the great increase in the number of trains, and a shortage of tank engines, some of the express 4–6–0 type are being used. There is no turntable between Byculla and Kalyan, so that main line engines running tender foremost are frequently seen. The engine sheds for the Bombay district are situated at Byculla on both sides of the main line. There is another engine shed at Kalyan but only 2–8–0 goods locomotives are stationed there.

It has been stated that there are only two passenger lines between Victoria Terminus and Byculla, but it should be mentioned that there are also two goods lines between Masjid and Byculla, which run into Bori Bunder and Wadi Bunder goods yards. At Parel there is an interchange junction between the Great Indian Peninsula Railway and the Bombay, Baroda and Central India Railway, which is very extensively used.

On the up side between Currey Road and Parel are the locomotive works of the Great Indian Peninsula Railway, and on the down side of the line at Matunga are the carriage and wagon works. Kurla is the largest of the suburban stations, having four large island platforms, and an extensive area of sorting and carriage sidings. Thana has two island platforms and one single-faced platform. Kalyan Junction has two island platforms of which one is exclusively used for local trains and the other for main line trains. Several stations have platforms only for the local line. These are Chinchpokli, Currey Road, Matunga, Vikhroli, Bhandup, Mulund, Diva and Dombivli. Parsik and Mumbra are on the local line only, the through lines, as mentioned above, taking a shorter cut through the Parsik tunnel.

BYCULLA STATION, FROM "A" CABIN.
Local lines to left, through lines to the right.

A word should now be said about Victoria Terminus. This magnificent station consists of seven platforms, of which it is now intended that lines 1 and 2 shall be exclusively used for local trains, No. 3 is to be used for either local or main line trains, Nos. 4 and 5 for main line departures; and Nos. 6 and 7 are the main line arrivals. Between Nos. 6 and 7 platforms there is a broad carriageway and exit

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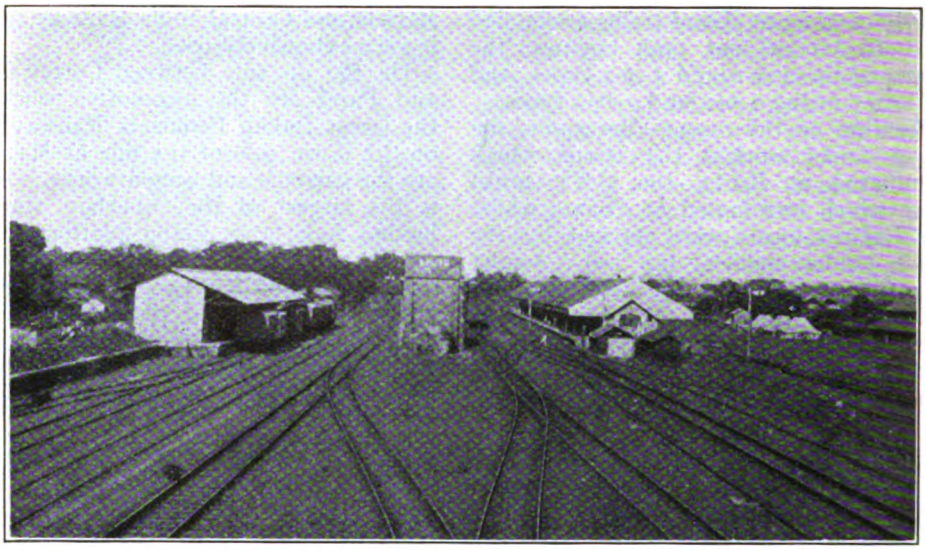

KALYAN STATION, FROM "E" CABIN.
Looking towards Bombay.

from the station. A large indicator shows the times of departure of all trains, and there are two large clocks suspended above the passenger concourse which are visible all over the station. Three signal cabins control the traffic into Victoria Terminus, known as A, B and C cabins.

The dimensions of the locomotives used in the suburban services are as follows :—

Type.	Official designation.	Diameter of coupled wheels.	Cylinders.
4-6-0 tender	D/4	6 ft. 2 in.	20½ by 26 in.
4-4-2 tender	E/1	6 ft. 6 in.	19½ by 26 in.
2-6-2 tank	P/1	5 ft. 6 in.	21 by 26 in.
0-6-2 tank	X/1	5 ft. 0 in.	18 by 26 in.

THANA STATION.
Through lines to the right.

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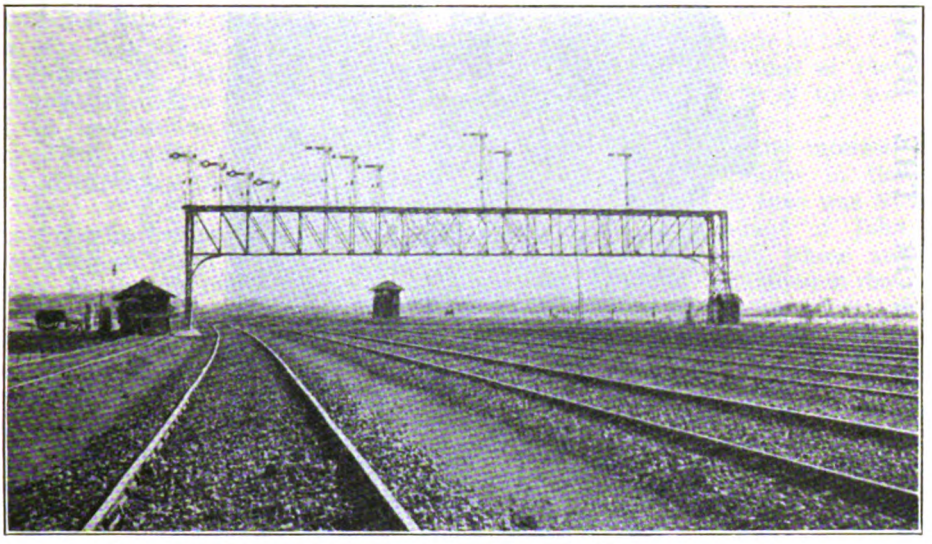
The first three types have outside cylinders and the 0–6–2 tanks have inside cylinders. Shunting at Victoria Terminus and at Kurla and Kalyan is done by 0–8–0 saddle tanks.

Fares on the suburban trains are cheap, but as from April 1st last year all fares were raised, main line and suburban, by 15 per cent. Hitherto, the fares have been :—First class, 18 pies per mile ; second class, 9 pies per mile ; third class, 3 pies per mile. 16 pies are equal to one anna, 12 annas to one rupee, and 15 rupees (approximately) to £1 sterling. Return tickets and season tickets are issued between all stations, Victoria Terminus to Kalyan inclusive.

The Great Indian Peninsula Railway local services are on the whole run very punctually though special difficulties, not to be met with in England, sometimes cause unpunctuality, as for example shortage of water, bad coal or even shortage of coal. The permanent-way of the Great Indian Peninsula Railway between Bombay and Kalyan is excellently laid with rails of 100 lb. to the yard and some fast running can be had on this section. The control system is in use on the Great Indian Peninsula Railway and the control offices for the stations Bombay to Kurla, and Kurla to Kalyan are situated at Kalyan at which place there are large reception yards for both up and down goods traffic.



SIGNALS AT KURLA "A" CABIN.

It may here be mentioned that it is by means of the Harbour Branch, as far as Vadala Junction and the Port Trust Railway, that the special boat trains with passengers for the Peninsular and Oriental Steamship Company's boats reach the new Ballard Pier, where these boats embark and disembark passengers. It is a most interesting journey, at a slow pace, through the vast sidings and warehouses of the Port Trust.

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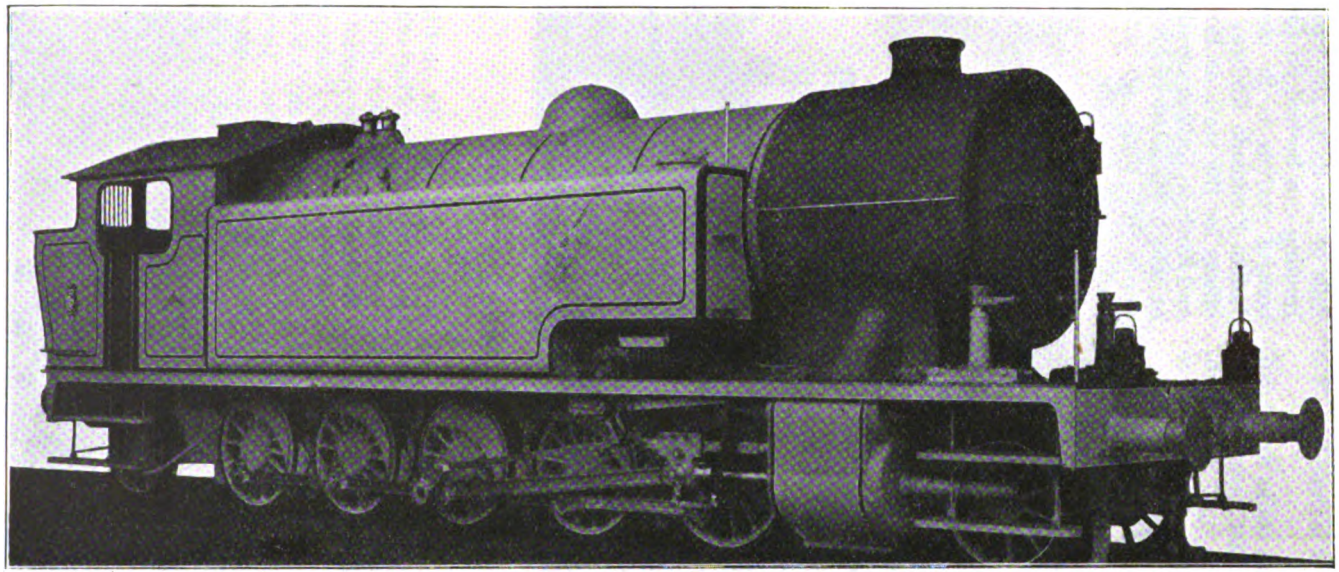
2-10-2 TYPE TANK LOCOMOTIVES FOR THE BOMBAY PORT TRUST.



BUILT by Messrs. Nasmyth, Wilson and Co., Limited, for the Bombay Port Trust Railway, a system of lines linking up all parts of the Bombay Docks Estate, with the Great Indian Peninsula Railway, and dealing with very heavy merchandise traffic. These engines are designed for banking service at the Wadala gravitation sorting sidings. Cylinders are 23½ in. by 26 in., and coupled wheels, 4 ft. 3 in. diam. Weight in working order is 105.63 tons. Fitted with Wakefield mechanical lubricator, "Ross" pop safety valves, Hulburd's patent "Servo" regulator, Whitaker's water-level indicator, &c.

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An Elizabethan Railway.

By H. BUTLER JOHNSON.

AMONG the many debts we owe to the spirit of progress and enterprise which pervaded the great Elizabethan Age, is the introduction of an early form of railway, or wagon-way, into one of our midland coalfields; a new departure, which, although it attracted little or no attention at the time, was destined in after years to play an all-important part in the history of the industrial system of the British Isles, and for that reason, if for no other, the story of how it came about deserves to be much more widely known that it hitherto has been.

As may be imagined, the sources of information on which we have to rely are meagre in the extreme. Contemporary annalists were busy describing events of far greater importance. Little more is discoverable than a mere skeleton of a framework on which to hang a narrative. Gaps exist in the sequence of years, impossible, so far, to fill up without calling in to our aid that two-edged weapon surmise. Yet despite these deficiencies sufficient material is available to enable us to make up what we hope will be a fairly well-connected account of our first English railway, and its long forgotten origination.

Coal Transport in 1580.

The starting point of the story may, for the sake of convenience, be set about the year 1580. At that time there were, among others, three coalfields in the Midlands, all of them doing, apparently, a good trade in the commodity they produced. These three coalfields were situated respectively at Bilborough, four miles to the west of the town of Nottingham; at Cole Orton, a little to the east of the town of Ashby-de-la-Zouch, in Leicestershire; at Bedworth, four miles to the north of the town of Coventry in Warwickshire.

The first mentioned of these coalfields, that of Bilborough, lay partly under the Manor of Wollaton, then owned by Sir Francis Willoughby, and partly under the Manor of Strelley, then in possession of the Strelley family, and the coalpits on both Manors seem, for the most part, to have been situated two miles or less from the great Nottinghamshire water-way, the river Trent. Sir Francis Willoughby possessed, in addition, interests in coal mines at Bedworth, Wolverhampton, and Cole Orton, a great uncle of his, Sir John Willoughby, having resided at the latter place about the middle of the sixteenth century.

Despite the Willoughby interest, however, the chief proprietor in the Cole Orton coalfield at this time was Nicholas Beaumont, a descendant of John, the fourth Lord Beaumont, whose ancestral home, Cole Orton Hall, stood in the centre of his estate on the same site as the present mansion of that name. Four sons had previously to the year 1580 been born to Nicholas Beaumont, their names, in order of succession, being as follows: Henry, who succeeded to the family estate of Cole Orton; Francis, who became a master in the famous London school, The Charterhouse; Thomas, who went to live in the Old Hall at Bedworth, where he worked some coal mines on a small estate he had inherited from his mother; Huntington, who was born in 1561, and is described a score years later, as being of Bedworth, Co. Warwick. It is with the career of Huntington Beaumont, the fourth son, we are chiefly concerned. Of his early life we know nothing, save the above-mentioned record of his presence at Bedworth about the year 1580. He was then, doubtless, residing at the Old Hall, along with his brothers Francis and Thomas, and, if his after life is any guide, learning the business of coal mining there.

Huntington Beaumont.

Then, unfortunately for our purpose, no records appear to be extant for a long space of time concerning the doings of Huntington Beaumont. In order to ascertain what his career had been in the meantime we are compelled to leap over

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a gap of nearly 30 years, and investigate the state of affairs on the Wollaton and Strelley Manors at Bilborough in the year 1609.

A careful perusal of the printed volume of the M.S.S. of Lord Middleton (*Historical M.S.S. Commission*, 1911) reveals the fact that there was a railway in existence at Bilborough in the year 1609, and that it served to carry the coal from the mines on the Manor of Wollaton to the adjacent river Trent, a distance of about two miles, and having been transferred thither, the mineral fuel was then carried in barges to Trent Bridge, Newark, Gainsborough, and adjoining places. Moreover, the M.S.S. clearly disclose that this railway had been in situ there at any rate as early as the year 1597, and that its lessee was Huntington Beaumont, whose permanent home was at the time at Bilborough.

In the year 1609 certain complications in connection with the transport of the coal from the mines had arisen at Bilborough, complications, which, as it turned out, were fortunate for the purpose of future historians, for had it not been for this, very little documentary, or indeed any kind of evidence, of the presence of a railway on the Wollaton Manor would have come down to the present time. It appears from the M.S.S. that in the year 1609 Huntington Beaumont was neglecting his business at Bilborough. As a matter of fact, as we shall show later, he had left the district temporarily in order to further certain ventures he had in hand in Northumberland. Accordingly, we find, in this self-same year, Sir Percival Willoughby, the successor of Sir Francis, who had died in 1596, entering into an agreement with one Thomas Fosbrooke, yeoman of the town of Nottingham, concerning the transport of coal from the mines on the former's estate.

"AT THE NEW RAYLES END."

This agreement (*Middleton M.S.S., p.* 172) is dated June 15, 1609, and is to the effect that Sir Percival covenants to set, stack, or rooke yearly for the next seven years "at Wollerton Lane End, at the new rayles end," 3,000 rookes of new-drawn coals (a rooke being approximately 2 tons) so that the carriage of Fosbrooke shall have weekly 70 "rookes" in readiness to carry thence to Trent Bridge. Sir Percival is also to erect by Christmas next two "bayes of building," for one to dwell in, and to appoint one to see to the safe-keeping of the coal at the rail end. Sir Percival is also to assign sufficient house room, barns and stable room, to Fosbrooke for the dry-keeping of his cattle, kept for the carriage of the coals. Sir Percival also agrees to let to Fosbrooke for the said term, all these "barges, boats or keeles" now or later in the possession of Sir Percival and Huntington Beaumont, Esq., along with a dwelling house and ground at Trent Bridge, with, in addition, another house at Newark, which was used, seemingly, as a depôt for coal. Fosbrooke, on his part, agrees to fetch the coal at the rate of 3,000 rookes yearly from the lane end, and convey them thence to Trent Bridge, and to pay Sir Percival 5s. 6d. for every rooke, and the sum of £100 beforehand. He also agrees to maintain the boats in good repair.

Although the making of the above agreement appears to have presented no difficulties, the carrying it out proved to be quite another matter. Under the date January 20, 1610, we find in the Middleton M.S.S. a letter from Robert Fosbrooke to Sir Percival, then in London, in which the writer replies to certain complaints, made by an agent of Huntington Beaumont, as to Fosbrooke's neglecting to make proper use of the boats and forward the coal business generally. Fosbrooke pleads in the way of extenuation, that he has not sufficient working capital to enable him to pay cash for the coal at the pits, and if Sir Percival will lend him the money, or grant him some credit, he will carry away a larger quantity of coal.

He concludes by imparting to Sir Percival the interesting information that Mr. Huntington Beaumont is to again have the coal under the adjoining Manor of Strelley, paying £3,500 for the privilege. "He hopes £1,500 gain from his Bedlington Pittes this year for his parte, and £500 from Strelley for his part towards the payment aforesaid, but I pray God that the adage be not trewe in this case '*parturient montes, nascitur ridiculus mus.*'" The "pittes" at Bedlington, alluded to, were situated on the north bank of the river Blythe, and we learn from other sources that Sir Percival Willoughby, as well as Huntington Beaumont, held shares in them.

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Sir Percival's reply to the above-quoted letter is not on record. All we do know is that the absent Beaumont's friends at Bilborough looked after his interests very zealously during the next few months, as the following letter dated May 1, from Fosbrooke to Sir Percival shows :—

"Right Worshipful," the letter, as given on page 177 of the Middleton M.S.S. commences, "in the beginning of my preparation for cariadg (sic) and purposed employment of your boats for the furtherance of the sale of your cole by water . . . I have been crossed, partly I fear of envy, and partly of otherwise. For I was cast into prison by Mr. Gyles, one of Mr. Huntington Beaumont's friends, and within four days after John Henworth (I being in prison) went down to Newark and took from our men the boat which Mr. Hynd and I had ordered to be wrought in your name . . . Sir Thomas Beaumont was with me and in myld manner at the first told me his brother, Mr. Huntington did greatly complain of me for my evil behaviour in my place, and therefore he were sorry to do it, yet he did wish me to make provision for some other stay . . . I beseeche you take order with Sir Thomas that we may have libertie to bring coles down the rayles by wagon for our cariadges only and we will bring them down by rail ourselves for Streelly cartway is so foul that few cariadges can pass."

This, the last reference in the Middleton M.S.S. to Robert Fosbrooke, and his troubles, is of more than passing importance, emphasising as it does at the conclusion that while the cartway, or ordinary road, leading from the pit of Strelley to the river Trent was practically impassable, the railway serving the same turn on Wollaton Manor was in full working order.

Although we hear no more of Robert Fosbrooke there is indirect evidence that Sir Percival must have taken some steps to set things right. An abstract given in the Middleton M.S.S. under the date 1613–14 shows that during the 12 months ending October 3, 1614, the total sale of Wollaton coal—the return from Strelley not having then come to hand—at Trent Bridge, the railes, and Newarke amounted to no less than 4,603 rookes, *i.e.*, nearly 10,000 tons, using our modern computation.

Railway or Wagon-Way.

So far so good. The above quoted extracts from the Middleton M.S.S. establish the fact that there was a railway, or wagonway, in full working order at Bilborough in the year 1609, and that up to that date it had been leased, or managed, by Huntington Beaumont, who was then 48 years of age.

The problem now remains to be solved as to when did it originate, when in fact did Huntington Beaumont appear on the scene.

We do not know. Contemporary records, so far available, are silent on this point. All we have been able to ascertain that there was a railway at Bilborough capable of dealing with 500 tons of coal a week, at least as early as the year 1597, and when we add to this the fact that in 1609 Huntington Beaumont had evidently been the lessee of the railway for some years, we can fairly assume that at the earlier date he was responsible for the welfare of the concern. An entry in the Middleton M.S.S. (p. 169) is our authority for the above and it runs as follows :—

"1598. Statement for charge, delivery and receipt of coals at Wollaton week by week from October (1597) to October (1598).

The whole of the gettes this yeare 13,26 rookes, 1 quarter. The whole sale, deliveri to all persons, railes and bridges, 13,271 rookes 2 quarters . . . The totall charge is £2,977 6s. 1d The totall receipt is £2,696 1s. 6d. . . ."

As Sir Francis Willoughby died in 1596, and as there is in the above evidence of the presence of a railway on the Wollaton Manor in the following year, a railway in full working order, we can conclude that the new method of transport was introduced into the locality during his lifetime, probably at his instigation. This last is not unlikely when we come to consider that Sir Francis was, from the commercial point of view, an adventurer born, a worthy prototype of those kings of industry who later on built up England's industrial greatness. He seemed to have ever lent a ready ear to any project laid before him. He spent large sums of money in opening out coal mines, in smelting iron, in making glass, in growing and using woad for dyeing purposes, and most of these ventures from the financial point of view turned out to be failures. These, and the ruinous expense involved in the building of Wollaton Hall, caused him to die a poor man, and leave a sadly embarrassed estate to his successor Sir Percival.

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A Pioneer Railway!

That Bilborough owed its pioneer railway in the first instance to Huntington Beaumont there can be but little doubt. His doings during his absence from Nottingham in 1609 and following years, all go indirectly to prove this, for they show that he took his novel ideas of mechanical transport with him wherever he went. It appears from certain documents preserved in the records of the Office of Crown Mines, that a small company of capitalists from the Midlands, consisting, *inter alia*, of Huntington Beaumont and his brother, Sir Thomas Beaumont of Bedworth, took over, about the year 1609, the remainder of a Crown lease of certain coal mines and salt pans at Cowpen and Bebside on the south bank of the river Blythe in Co. Northumberland. The venture proved to be a failure, and about the year 1614 the Midland lessees abandoned the works, having lost large sums of money and incurred heavy obligation for the future as well!

Among the plant and material they left on the ground was a railway, 500 yards in length, running between the coal pits and the salt pans, near the sea, at the mouth of the river Blythe, a railway which was constructed during their term of occupation. The records in the Crown Mines Office show that, after Beaumont and his partners left the place, a certain Peter Delavel, one of the original lessees, entered the works and carried off "all the said rayles set upon the land and ground of Bebside for 500 paces in the wagonway on both sides of the way."

This was we believe, the second railway to be made in England, and its originator Huntington Beaumont, is alluded to by Thomas Grey in his 'Chorographia, or a survey of Newcastle-upon-Tine,' published in 1649 (pp. 24–25) as follows:—

"Some south country gentlemen hath with great hope of profit come into this country to hazard their monies in coale pits. Master Beaumont, a gentleman of rare ingenuity and great parts adventured with our mines with his thirty thousand pounds; who brought with him many rare engines not known in these parts; as the art to boore with iron rodds, to try the deepnesse and thicknesse of the coale, rare engines to draw water out of the pits, wagons with one horse to carry down coales from the pits to the Staithes, to the river, &c. Within a few years he consumed all his money and rode home upon his light horse."

In the corrected proofs for a later edition of his book, Grey considerably reduced the losses of Beaumont and his friends, bringing them down to about £4,000, a much more likely amount considering the high purchasing power of money in those days.

Beaumont the First Railway Engineer.

As will doubtless have been noted by the reader, Grey's eulogistic remarks anent "Master Beaumont," and his "rare engines" all help to substantiate our theory that to Huntington Beaumont alone the honour of introducing the first railway into this country is due. Where he first got the idea from is uncertain. He may have travelled in Germany where an elementary form of railway, or tramway, had for nearly a century been in use in the metalliferous mines. Or again, he may have come into contact with some of the German miners who came over in the reign of Queen Elizabeth to work the metalliferous mines in Cumberland and elsewhere, and obtained information from them. In those days, troublous as they were, English mine owners appear to have been kept well informed as regards the Continental developments of the industry they were engaged in. Curiously enough the Middleton M.S.S., on pages 174-175, contain the detailed proposals of an inventor, one Mr. Rooke, who desires to sell to Sir Percival a new form of pump to drain his coal mines. Mr. Rooke after stating the great advantages that would accrue to Sir Percival if he purchased one of his pumps, concludes with the interesting statement that "at Wollaton, to further any reasonable project, there are models to be seen of all the water-workes that are of any worth or valeue in Italye, Germanye, or the Low Countryes," a statement that tends to show the progressive state of the English mining industry at the time.

Huntington Beaumont, during the Cowpen and Bebside enterprise, lived at Bebside Hall, along with his friends Edward and Dorothy Delavel. He had returned to Nottinghamshire by the year 1615, for under that date in the Middleton M.S.S. (p. 183) we find a letter from him—the only letter of his extant—written at Bilborough, and addressed to Sir Percival Willoughby.

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This letter, written seemingly in response to one from Sir Percival asking him to enter into a bond for £2,000 to a Sir John Hollin and another, bears unmistakable evidence of having emanated from a ruined and broken-hearted man. After pointing out how utterly impossible it is for him to comply with Sir Percival's request, Beaumont concludes as follows :

"I pray, therefore, good sir, first let us endeavour to get out of the old bondes and then I shall be ready to enter into new as far as you please, for I doe assure you I am already so far in bondes about these businesses as they were to begin again all the coal mines in England should stand alone for me before I would adventure so far in them all . . . And this with my kindest salutation to yourself, and my good ladies all, I take my leave, your very assured lovinge friende,

HUNTINGTON BEAUMONT."

We hear no more of him. Six years later, 1621, he died and was buried at Bilborough, leaving a widow to survive him a few years. He deserved a better fate, this pioneer of the English railway, than to die unhonoured and unsung in an obscure country village. The younger son of an ancient and wealthy house, he might have sought fame and found it in other and easier ways in those stirring times. A product of a great age, he preferred to take another road, and, obscure and unknown, leave the harvest he had sown, for those who came after him to reap.

A WELL-KNOWN LONDON & NORTH WESTERN RAILWAY LOCOMOTIVE.

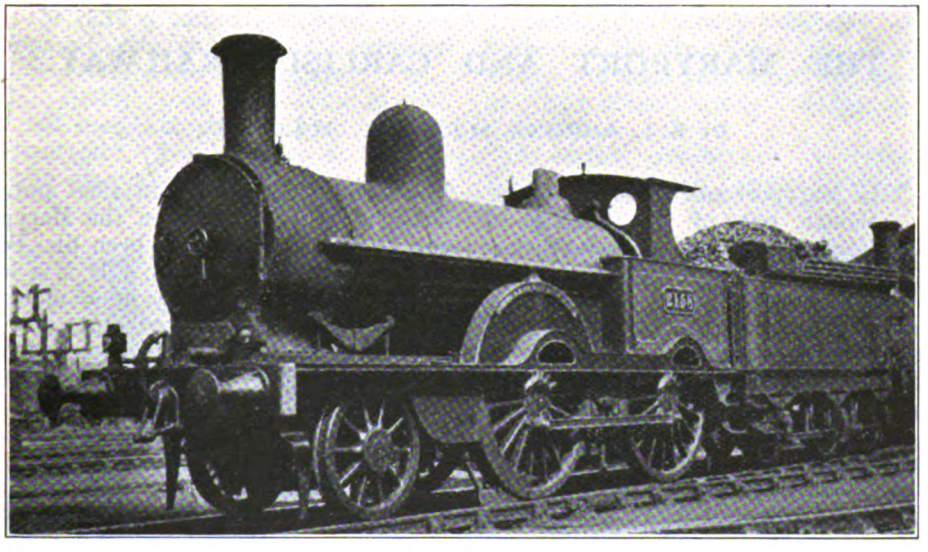

Photo.] [*C. J. Alcock.*

LONDON & NORTH WESTERN RAILWAY ENGINE No. 2158, "SISTER DORA."

This engine was originally named "Serpent." *See* RAILWAY MAGAZINE, January, 1919, page 47, for full history.

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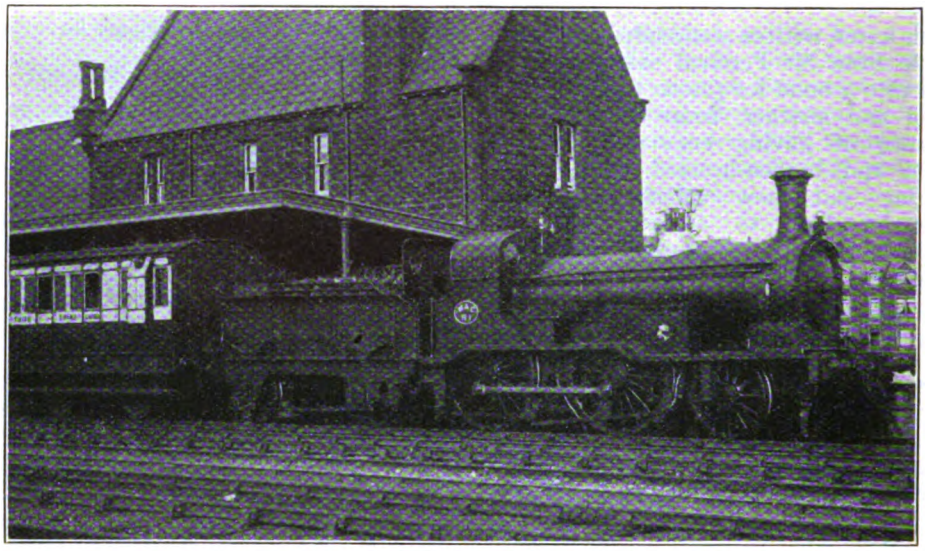

Photo.] [*Loco. Publishing Co., Ltd.*

2-4-0 LOCOMOTIVE R1 (FORMERLY No. 19), BUILT AT MARYPORT.

Locomotive and Train Working in the latter part of the 19th Century.

THE MARYPORT AND CARLISLE RAILWAY.

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

THE Maryport and Carlisle Railway, though one of the smallest of English railways, is nevertheless one of the oldest, for the first portion between Maryport and Aspatria was opened in July, 1840, and the remainder of the existing main line through to Carlisle was completed in 1845. Subsequently, there were only two additions, viz., a single loop line, known as the Bolton branch, which leaves the main line at Aspatria and passed through Mealsgate to Aikbank Junction, where it again joins the main line, and secondly the Derwent branch from Bullgill, about four miles east of Maryport, to Brigham Junction on the London and North Western section between Cockermouth and Workington. The main line is double, and is about 28 miles in length between Maryport and Carlisle. The Bolton loop is 7¼ miles and the Derwent branch six miles long. The former was opened in 1866 and the latter in 1867, since when the Maryport and Carlisle Railway has been like Peter Pan, and never grown up. It is a local railway depending chiefly upon minerals, mostly coal, ironstone and limestone, for its traffic, much of which is handed over to the large main line companies at Carlisle.

At Currock Junction, approaching Carlisle, the line forks. The western arm of the fork is used for goods traffic only and terminates at Rome Street Junction, where it joins the Carlisle Goods Committee's lines. The eastern arm bends round, and joins the "Citadel Station Joint Committee's lines," over which the passenger trains run into the Citadel Station. A somewhat curious feature of this portion of the railway topography is that the engine sheds of the Glasgow and South Western Railway are situated close to

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Currock Junction, and the engines of this company use the Maryport and Carlisle Railway in order to obtain access to them. The principal engine sheds of the Maryport and Carlisle Railway are at Currock and Maryport.

The main line gradients are comparatively easy. The line rises steadily for the first nine miles from Maryport, generally at 1 in 280 to 1 in 294, except that the last mile is at the rate of 1 in 221. The summit of the railway is at the ninth mile-post, whence there is a fall for eight miles mostly at 1 in 388 to 1 in 241. The remaining eleven miles consist of an easy rise and fall of which one mile only rises at 1 in 218.

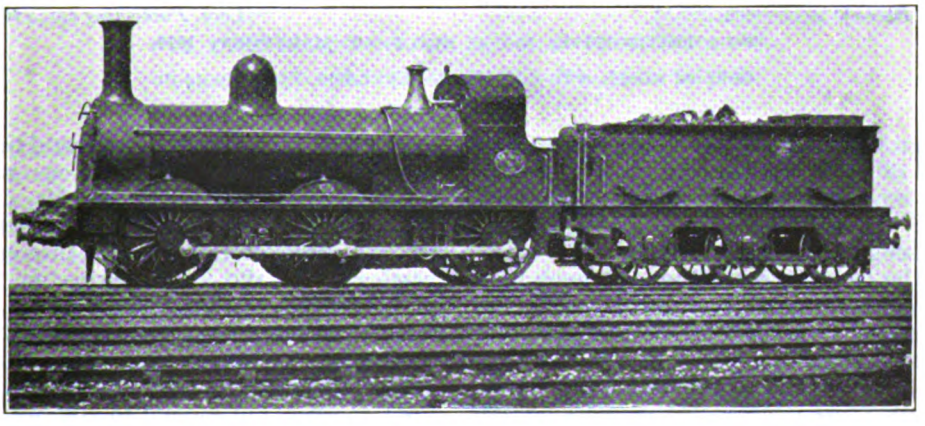
The Bolton loop line is so-called from the fact that a considerable portion of the line runs through the large parish of "Boltons," which is divided into two portions, "Boltons High" and "Boltons Low," suggestive of a strong ecclesiastical flavour. They get a good deal of Bolton into this area, including the two villages of Bolton Gate and Bolton Low Houses, and once upon a time there was also a Bolton colliery. Consequently, to avoid mutual jealousy and inter-tribal bickerings, the railway company lumped all the Boltons into one, and called the principal station serving them "Mealsgate."

The Bolton loop is heavily graded, and rises steeply all the way from Aspatria to Mealsgate, 1¾ miles being at the rate of 1 in 70. The three miles down the other side to Aikbank Junction descend at 1 in 60 for two miles, and 1 in 90 for one. On the Derwent branch there is a two-mile rise of 1 in 80 from Bullgill to Dearham, and a moderately-graded fall thence to Brigham.

The main line passenger train service in 1891 consisted of seven trains each way between Maryport and Carlisle. Most of them stopped at all intermediate stations and took 65 to 70 min. for the 28-mile journey. The two "crack" expresses, if I may so term them, were the 1.20 p.m. from Carlisle and the 3.13 p.m. from Maryport, both of which missed an odd station or two, and completed the journey in 62 min.

The British Post Office, for the sole benefit of which the long-suffering British citizen is now allowed to exist, in those days did a really good pennyworth of work for a penny. On the Maryport and Carlisle Railway it allowed the down mails from Carlisle to be conveyed by a mineral train, which left that city at 4.15 a.m., and by dint of hustling got into Maryport at 5.40 a.m. But when it came to the conveyance of the up mails, it was not so complaisant, and a mineral train was not good enough. Therefore the railway company, at the request of the Post Office, put on a passenger and mail train which left Maryport at 7.23 p.m. and reached Carlisle at 8.27 p.m.

A certain number of the main line trains ran through between Carlisle and



0-6-0 LOCOMOTIVE No. 9.

Constructed at Maryport, 1875, and designed by Mr. H. Smellie. Cylinders, 18 in. by 28 in. Coupled wheels, 5 ft. 1 in. diam.

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Whitehaven, but the engines were changed at Maryport, and between the latter station and Whitehaven the London and North Western Railway provided the locomotive power. Occasionally, however, a few excursion and special trains were worked through by Maryport and Carlisle engines, and some London and North Western excursions from Whitehaven ran through to Carlisle without change of London and North Western engines.

The Bolton loop was peculiar in that practically the whole of the passenger and coal traffic was worked from the western or Aspatria end. Between Wigton and Mealsgate, over the eastern end of the loop, there was only one train per day in each direction, which conveyed an "omnium gatherum" of assorted passengers, goods and minerals.

The Derwent branch was of much more importance, and the passenger service consisted of six trains in each direction, most of which were through trains between Maryport and Cockermouth. Two reversals were necessary in working this service. When a train from Maryport reached Bullgill, the engine had to go round the train, in order to take it on to Brigham over the branch. But at Brigham the train again arrived in the wrong or "trailing" direction, and another reversal was necessary to re-start it for Cockermouth. Between Brigham and Cockermouth, 2⅛ miles, the Maryport and Carlisle engines work over the London and North Western Railway. The above trains were usually worked by tender engines, so that it was necessary for the engine to run tender first during part of the journey. More recently a tank engine has also been employed on this service.

A somewhat unusual feature of the Maryport and Carlisle working of last century was that all engines, whether working passenger, goods or mineral trains, carried the same headlights, one white light on the right hand side. Mr. Thos. Blain, the courteous general manager, to whom I am indebted for several interesting particulars of the line, informs me that probably this method was simply a survival of some old arrangement by which the engines of all trains carried a headlight, not to distinguish one class of train from another, but merely to give warning of their approach.

The London and North Western Railway worked two or three limestone trains over the Derwent branch between Brig-

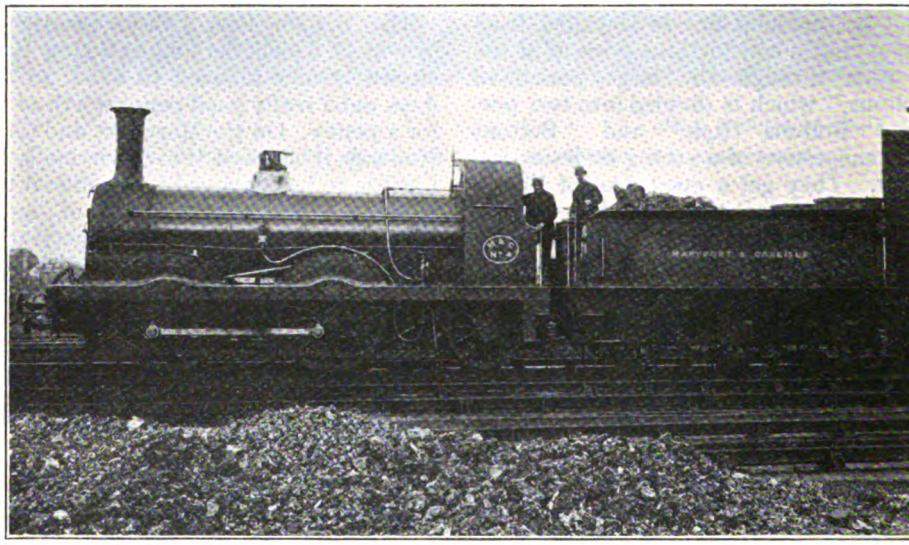

Photo.] [*Loco. Publishing Co., Ltd.*

0-4-2 LOCOMOTIVE, No. 4, BUILT AT MARYPORT, 1879.

Coupled wheels, 5 ft. 7 in. diam. Cylinders, 17 in. by 24 in.

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ham Junction and the quarries at Papcastle, and at Linefoot Junction the Furness engines exchanged mineral traffic with the Maryport and Carlisle Railway, much of which was through traffic to and from Carlisle.

Turning now to the locomotives which worked the line, there were two types of passenger engine. The main line engines were of the 2–4–0 type with inside bearings for all wheels. From 1870 until June, 1878 the chief locomotive engineer was Mr. Hugh Smellie, who had been trained at Kilmarnock on the Glasgow and South Western Railway under the brothers

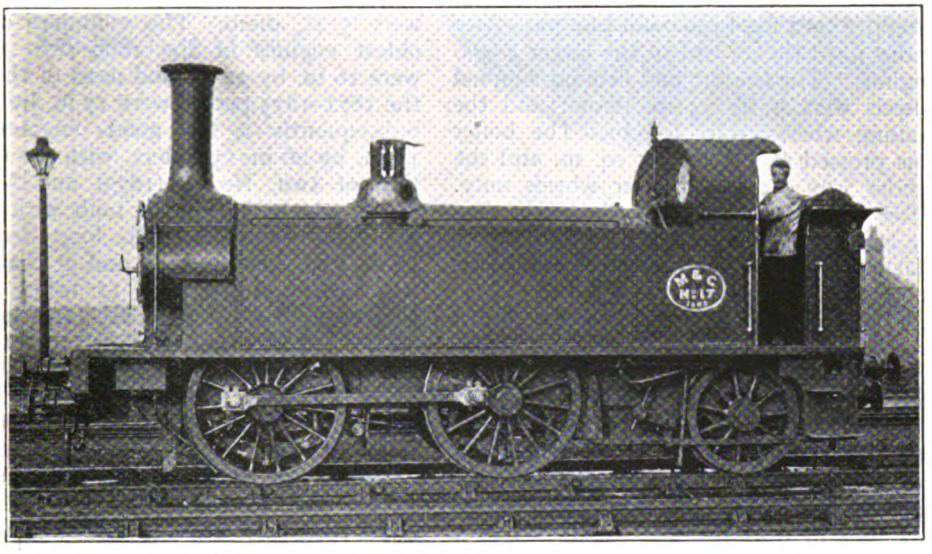

Photo.] [*Loco. Publishing Co., Ltd.*

0-4-2 TANK ENGINE No. 17, BUILT AT MARYPORT, 1865.

Coupled wheels, 4 ft. 9 in. diam. Cylinders, 16 in. by 22 in.

Patrick and James Stirling. Coming from the land of the domeless boiler, one would naturally think that Mr. Smellie would have adopted it on the Maryport and Carlisle Railway. But nearly all his engines had domes, and it was only on his return to Kilmarnock in 1878 that he definitely adopted the domeless boiler with Ramsbottom valves on the boiler barrel. At the same time his successor on the Maryport and Carlisle Railway, Mr. Campbell, also adopted the same type of domeless boiler. Of the engines illustrated, the 0–6–0 goods engine No. 9 is of Mr. Smellie's design and the other three engines have Mr. Campbell's type of domeless boiler.

Returning to the 2–4–0 engines, there were four, all of which were built at the Maryport works of the company, where the great majority of the Maryport and Carlisle engines were constructed. The earliest of the type, No. 19, appeared in 1867, before Mr. Smellie came on the scene. This engine had coupled wheels 6 ft. 0½ in. diam., leading wheels 4 ft. 1½ in. diam., cylinders 16 in. by 22 in. and 120 lb. pressure. It weighed 31 tons 4 cwt. and was provided with a four-wheeled tender. It was smaller than the three subsequent engines by Mr. Smellie, and after some years' work on the main line trains was relegated to the Derwent branch passenger trains. In 1884 it was renumbered R 1 on the duplicate list, and terminated its existence in 1914 after some years' service as a spare engine.

The three 2–4–0 engines designed by Mr. Smellie were considerably larger. The coupled wheels were 6 ft. 1½ in. in diam., leading wheels 4 ft. 1½ in. diam. cylinders 17 in. by 24 in., and boiler pressure 135 lb. Their weight was 34 tons 2 cwt. in working order and they were provided with six-wheeled tenders. Of

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these No. 13 was built in 1874, No. 8 in 1876, and No. 10 in 1878. They have always been employed on the main line trains, and are still in service with larger domed boilers and 150 lb. pressure.

The other passenger engines were 0–4–2 "mixed traffics," of which there were six in all. These were employed both on the main line and branches for passenger and goods trains, but most of their work was done on the passenger trains. They were essentially a Glasgow and South Western type imported by Mr. Smellie. One of the earliest of the class, No. 3, built at Maryport in 1873, was smaller than the succeeding engines, and had cylinders 16 in. by 22 in. only. It was intended and used for main line passenger trains until the advent of the larger 2–4–0 engines. The leading and driving coupled wheels were 5 ft. 7½ in. diam., and the trailing wheels 3 ft. 10½ in. The boiler was pressed at 135 lb. per sq. in. and the tender was carried on four wheels only. After its supersession on the main line by larger engines, it was relegated to the Maryport and Cockermouth trains over the Derwent branch.

Of the other five 0–4–2 engines, which had 5 ft. 7½ in. coupled wheels and 17 in. by 24 in. cylinders, two only, No. 5 (1872), and No. 4 (1879), were built under Mr. Smellie's supervision, three others, No. 2 (1889), No. 15 (1892), and No. 16 (1895) appearing after a long interval. These engines had 140 lb. pressure and weighed 35½ tons in working order. No. 5 had a four-wheeled tender when first built, which was changed afterwards for one with six wheels, similar to those of the other engines. Several of these engines are still used for main line passenger trains.

There were two 0–4–2 side tank engines, No. 17 with 4 ft. 9½ in. coupled wheels, and No. 18 with 5 ft. 2½ in. coupled wheels, the cylinders of both being 16 in. by 22 in. They were built at Maryport in 1865 and 1867 for the Bolton and Derwent branches respectively. On the opening of the collieries on the Bolton branch between Aspatria and Mealsgate about 1870, No. 17 proved too light for the work, and the Bolton branch had to be worked with six-coupled tender engines built by Beyer. Peacock & Co., between 1871 and 1873. At a later period the tank engines were employed as shunting engines at Currock Yard (Carlisle) and Maryport. It may be added that the present locomotive superintendent, Mr. Adamson, completely rebuilt No. 17 in 1907 as a 0–6–0 tank engine with 17 in. by 24 in. cylinders, and it is now used for shunting at Carlisle. Engine No. 18 still remains a 0–4–2 tank engine, and since 1908 has been relegated to the duplicate list as R 5.

The 0–6–0 goods and mineral engines were of sorts and sizes various, but all had inside bearings. The wheels varied, some being 4 ft. 9 in., but the majority were 5 ft. diam. The cylinders of the oldest engines of the 1869–1870 period were 16 in. by 22 in. and most of those of the 1871–1875 period were 17 in. by 24 in. Subsequently a few goods engines had 18 in. by 26 in. cylinders, with the exception of two, No. 9 (1875) and No. 14 (1877) which Mr. Smellie built with 18 in. by 28 in. cylinders. The long stroke of 28 in. was very unusual, and at that time was possessed by only 11 other goods engines in the country, viz., five engines on the Stockton and Darlington section of the North Eastern Railway, which had 17 in. by 28 in. cylinders, and six heavy coal engines which Mr. P. Stirling built at Doncaster with 19 in. by 28 in. cylinders.

Nos. 9 and 14 had a long wheel base of 17 ft., coupled wheels 5 ft. 1½ in. diam. boiler pressure 130 lb. and weighed 37 tons 3 cwt. in working order. They originally had domed boilers.

Of the goods engines built between 1871 and 1899 seven were constructed by Beyer, Peacock & Co., Limited, the remainder being built at Maryport.

There were also two small 0–4–0 shunting side tank engines with outside cylinders built in 1880–1 by Messrs. Neilson & Co., one of which, No. 15, was sold in 1891.

The writer wishes to acknowledge his indebtedness for many of the foregoing particulars to the kind assistance of Mr. T. Blain, the general manager, and Mr. J. B. Adamson, the chief locomotive superintendent.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A.M.Inst.T., A.I.Loco.E.

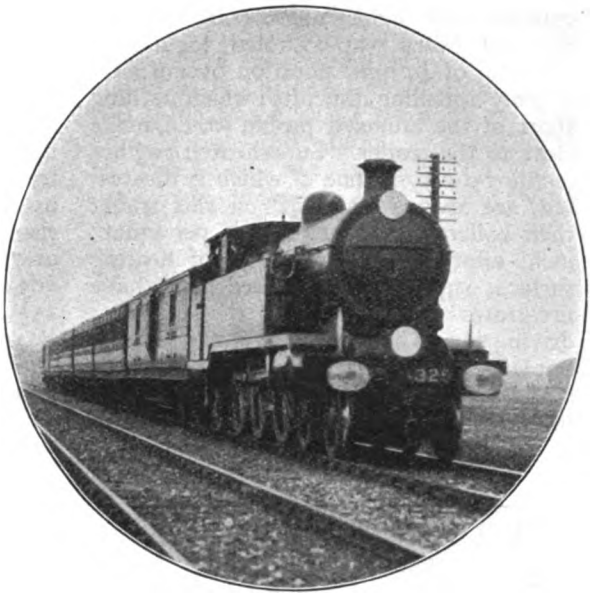

Photo.] [*E. A. Gurney-Smith.*

LONDON, BRIGHTON AND SOUTH COAST RAILWAY.
Portsmouth-Brighton Fast Train.
4-6-2 tank locomotive, No. 325, "Abergavenny."

IT is perhaps permissible to mention, in commencement, that this is the 150th article of this series for which I have been responsible. Strangely enough, the 50th appeared in August, 1914, which was the first month of the war; the 100th was published in October, 1918, which was the last active month of the war, the Armistice being signed early in the following month; and now the 150th marks the last month of the post-war, or recovery, period, allowed to the railways to form themselves into the grouping which takes effect from the beginning of 1923. This is truly a curious chain of coincidence, and makes one wonder what epoch-marking change remains to be chronicled in the 200th article, should I still be responsible for their conduct over so lengthy a period. In the years immediately ahead of us, the chief interest in connection with the observation and record of locomotive performance will lie in the exchange of locomotive power which is almost bound to take place within the confines of each railway group. A foretaste of this condition of affairs is given in the performance section of the present article, in which are detailed samples of the work of London and North Western engines, and those of the late Lancashire and Yorkshire Company, over the lines of each other's systems. That similar exchange workings are in contemplation in the immediate future is apparent when one hears, for example, of North British "Atlantic" drivers learning the North Eastern road from Berwick down to Newcastle, of the North Eastern Railway finding locomotive power for the Great Eastern through York expresses, and so on. These considerations open up some peculiarly fascinating prospects for train timers in the days to come.

And now for the runs referred to, which relate largely to locomotive performance on the late Lancashire and Yorkshire system, now Division "B" of the London and North Western Railway. We will commence with a route which has never previously figured in these columns, but over which there is in daily operation what is with very little doubt the hardest express duty, in proportion to the weight of the engine employed and the steam-producing capacity of its boiler, entrusted to a tank engine on any British railway, without exception. The train concerned is the 4.25 p.m. from Salford to Colne, taking out nightly a train of ten bogie

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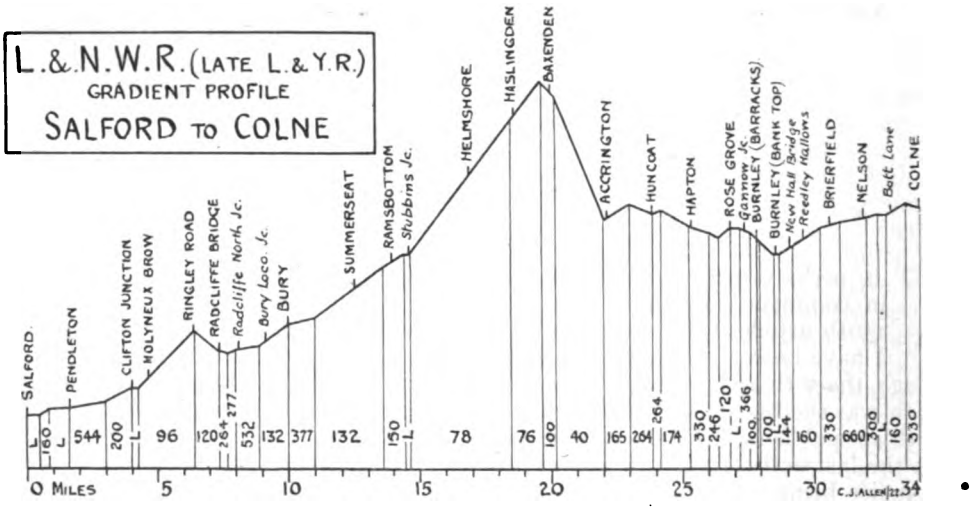
vehicles, of light non-corridor stock, but with every seat occupied, for a non-stop run of 49 min. duration over a road of truly appalling difficulty, which nothing short of the annexed profile would make clear to the reader. Superheated engines of the 2-4-2 type, one of which is illustrated, are always employed on this train; their boilers, pressed to 180 lb. per square inch, afford only 954 sq. ft. of heating surface, superheater included, and have fire-grates of only 18·8 sq. ft. area; driving wheels have a diameter of 5 ft. 8 in., but large cylinders of 20½ in. diam. by 26 in. stroke are provided, and 39·3 out of a total of 66·5 tons weight are available for *five miles at one in seventy-eight continuously* against the engine, approached by another modest incline of 5½ miles mostly at 1 in 132, not to mention such further trifles as the recovery from Clifton Junction slack up 2¾ miles at 1 in 96, and the recovery from the dead slowing through Accrington up a mile at 1 in 165! The total vertical rise against the engine, indeed, works out at 750 ft., or exactly 27 ft. per mile, but 695 ft. of this rise are concentrated in the 15½ miles between Clifton Junction and Baxenden Summit, which works out at 44·8 ft. per mile, or an average adverse grade of 1 in 118 throughout this distance. Furthermore, there is practically nothing



adhesion. The ratio of heating surface to cylinder volume—96 sq. ft. to 1 cubic ft.—is probably lower than the corresponding ratio in any other British locomotive type.

In the discussion which followed a paper that I read recently before the Institution of Locomotive Engineers, one of the speakers went so far as to suggest that these Lancashire and Yorkshire superheated tank engines, which had been mentioned in the paper, "can run certain short distance expresses from one town to another, 18 or 20 miles apart, with perhaps 120 or 130 tons behind them." It would have surprised him mightily, I fancy, could he have accompanied me on the footplate of No. 1532, with a train of *two hundred and fifty* tons all told, for a non-stop run of some 28½ miles, including in the way of a descent over which high speed can be run; the average speed down the 1 in 40 of Baxenden bank is usually kept down to 45 m.p.h. The average scheduled speed, I grant, is not higher than 34 m.p.h., but for all that, if any harder British tank locomotive task can be produced, taking all circumstances into consideration, I should be very interested to hear of it. I may add that the necessary facilities for watching the footplate working on this journey were very kindly and readily granted by Mr. Ashton Davies, General Superintendent, and Mr. F. W. Attock, Superintendent of Motive Power of the Northern Division of the London and North Western Railway.

The first run was made with a nine-coach train, and started badly, in that we were brought to a dead stand at Windsor

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Bridge, owing to an up Liverpool express crossing our path; the same delay was experienced in Run 5, and we were also severely slowed on Run 4. Nevertheless, we got up to 40 m.p.h. on the rising grades beyond Pendleton, and then, easing to 35 through Clifton Junction, did not fall below 30½ m.p.h. on the 1 in 96 up to acceleration to 41½ up the easier strip at 1 in 150 to Stubbins Junction. Thence, up 1 in 78 continuously, we fell to 28 m.p.h. at Helmshore, 26½ at Haslingden, and there was a slight recovery to 28½ through the latter station, ere we fell to 26 m.p.h. at the summit. Baxenden bank was descended and Accrington

TABLE A.—L. AND N.W.R. (L. AND Y. SECTION). 4.25 P.M. SALFORD TO COLNE.

Distance.	Run No.:	Schedule.	1	2	3	4F	5	Total Vertical Rise (approx.)
	Engine No.:		1532	380	1532	1532	1351	
	Engine Type:		2-4-2 TS.	2-4-2 TS.	2-4-2 TS.	2-4-2 TS.	4-6-0 P.	
	Driver:		Blake-more.	Blake-more.	Turner.	Shorrock.	Clough.	
	Load (axles):		*36	*40	*40	¶40	*40	
	Load (tons tare):		207	237	229	222	231	
	Load (tons full):		235	265	255	250	260	
Miles.		min.	m. s.	m. s.	m. s.	m. s.	m. s.	feet.
0·0	Salford .. dep.	0	0·00	0·00	0·00	0·00	0·00	
			sig. stop			sigs. sev.	sig. stop.	
1·7	Pendleton .. pass.	..	6·25	3·55	4·10	4·30	5·50	55
4·0	Clifton Jc.	7	10·10	7·15	7·30	8·00	9·35	
							p.w.r.	
6·3	Ringley Road ..	..	14·30	11·45	11·30	12·00	14·45	120
8·1	Radcliffe N. Jc. ,,	..	16·45	13·55	13·40	14·20	17·10	
					sigs. slt.			
9·9	Bury .. .. ,,	17	19·05	16·15	15·55	16·40	19·50	
12·5	Summerseat ,,	..	22·35	19·50	19·30	20·40	23·50	200
13·9	Ramsbottom ,,	23	24·40	22·05	21·40	23·00	26·15	
					sigs. slt.			
14·6	Stubbins Jc... ,,	..	25·40	23·15	22·45	24·10	27·25	
16·7	Helmshore .. ,,	..	29·35	27·30	26·45	28·15	31·50	
18·6	Haslingden .. ,,	..	33·55	31·45	30·55	32·20	36·15	335
20·0	Baxenden .. ,,	..	36·35	34·30	33·30	34·50	38·55	
							sigs.	
22·2	Accrington .. slip	40	*40·10	*38·05	*37·25	¶ 38·20	*43·40	
			sigs. sev.					40
23·8	Huncoat .. pass	..	43·55	40·55	40·25	41·20	47·00	
25·3	Hapton .. ,,	..	46·10	42·30	42·05	43·00	48·50	
			sigs.	sigs.		sigs. sev.		
26·8	Rose Grove .. ,,	46	49·00	44·35	43·45	46·05	50·40	
27·8	Burnley B. .. arr.	49	51·35	46·55	45·55	48·40	52·45	
27·8	Net times (min.) ..	49	45½	46½	45½	46½	48½	750

TS.—Tank Superheated. P.—L. & N.W.R. " Prince of Wales " class.
¶ No slip portion on this run. F—Recorded from the footplate.
* Less 8 axles = 50–55 tons full, from Accrington. set. = slight. sev. = severe.

Ringley Road. The brief subsequent descent produced a top speed of 53 m.p.h., ere we started on our unbroken climb of all but 12 miles to Baxenden summit. At Bury we were doing 45 m.p.h.—a rate inclined slightly to rise up the ensuing 1 in 377; at Summerseat the speed was 42, and at Ramsbottom 40 m.p.h., up a continuous ascent at 1 in 132, with a slight station threaded with the utmost caution, all the lost time having now been regained, but Driver Blakemore was not suffered to finish punctually, owing to a series of signal checks.

On the second journey, with the same driver and the normal ten-coach load, we got up to 45½ m.p.h. beyond Pendleton, and passed Clifton, at a reduced rate of 34,

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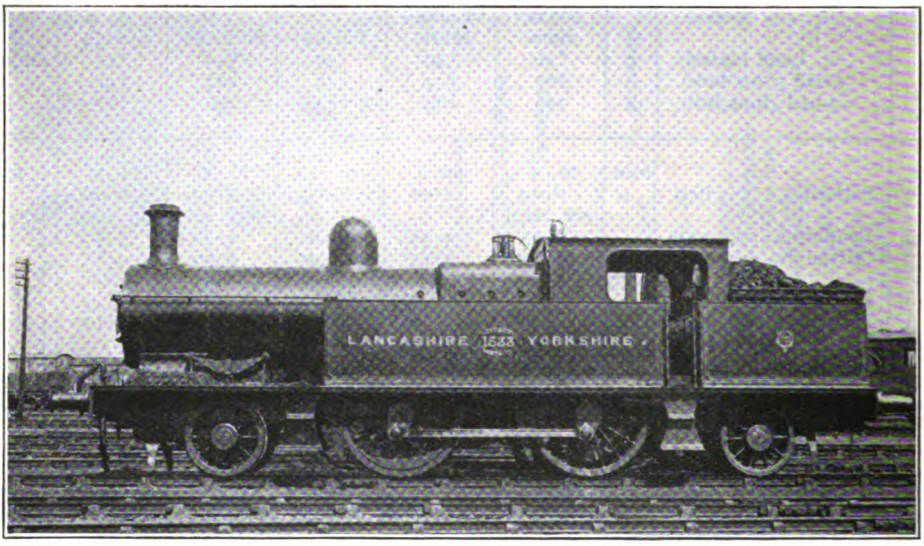
within 15 sec. of the difficult starting allowance. We were doing 29½ m.p.h. steadily at Ringley Road, touched 53 at Radcliffe North Junction, passed Bury at 42½ m.p.h. and accelerated to 45 up the 1 in 377; breasted Summerseat at 40 m.p.h. and Ramsbottom at 34, with an increase to 38 at Stubbins Junction; while the speeds on the concluding climb were 26½ m.p.h. at Helmshore, followed by a notable increase to 28½ m.p.h. at the summit. After Accrington, in negotiating the short falling gradient past Hapton we reached fully 60 m.p.h. ere being signals to 33 m.p.h. at Stubbins Junction. Notwithstanding this, the whole of the 5 miles at 1 in 78–76 were climbed at an unvarying rate of 27½ to 29½ m.p.h., the lowest figure being occasioned by a violent slip as the engine crossed the mud-greased level crossing at Helmshore. Turner lost a full half-minute by excessive caution in running through Accrington, but we were fortunate in getting a clear road through Rose Grove, and concluded with a shade over 3 min. in hand on this arduous booking. The two checks probably did not cost us more than 25 sec. between



LONDON AND NORTH WESTERN RAILWAY (DIVISION "B.")
2–4–2 superheated tank engine, No. 1533, late Lancashire & Yorkshire Railway.

again delayed by signals through Rose Grove.

Turner's run, in column 3, was on the basis of times achieved probably the best of the series. We were a little slower in getting away, but attained 45½ m.p.h. again beyond Pendleton, and eased to 40 at Clifton. Up the 1 in 96 to Ringley Road our sustained speed was 34 m.p.h., and we then reached 55 m.p.h. by a very rapid acceleration past Radcliffe Bridge. There was a slight signal check as we approached Bury, which knocked some 10 m.p.h. off our speed, but we accelerated from 40 m.p.h. at Bury to 45 at the end of the 1 in 377, and were maintaining 41 m.p.h. at Summerseat and 39 at Ramsbottom, when we were again brought down by adverse them, but with normal running at Accrington, the net time might have been cut to 45 min. exactly.

And now I come to my footplate journey with Driver Shorrock and Fireman Gough, recorded in column 4—one of the most fascinating experiences of its kind within my recollection. Any observer who is privileged to occupy the footplate of an express engine when it is being worked under onerous conditions is bound to realise the exact science that lies behind driving and firing; but in a case like this, where a small-boilered engine is being pushed practically to the limit of her capacity for producing steam, and the slightest error of judgment on the part of the fireman in "placing" his fuel, or of

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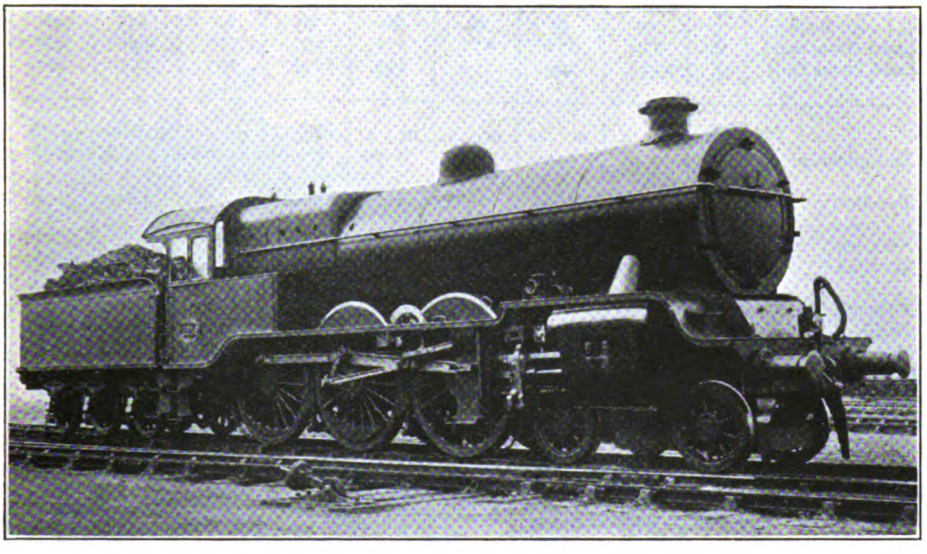
the driver in his method of utilising the steam produced, may result in lack of steam at the critical moment, and in loss of time, or even "stalling" of the engine, over grades such as these locomotive management becomes a job for thorough experts only. Small wonder is it, then, that the working of this train is entrusted only to a "top link" of four drivers, whose consistent work on this difficult duty does tremendous credit to the shed responsible—Agecroft—and it is equally a matter for no surprise that three engines are kept specially "tuned up" at the shed



LONDON AND NORTH WESTERN RAILWAY (DIVISION "B.")
Rebuilt four-cylinder 4-6-0 locomotive, No. 1516, late Lancashire & Yorkshire Railway.

so that one of them may be always available for this turn. Still more creditable to locomotive men on a system of such exceptionally complex workings and locomotive manning as the Lancashire and Yorkshire is the fact that the crew manning a 2-4-2 tank one week may have a four-cylinder 4-6-0 express engine the next, and sometimes, indeed, in the course of a single day may work one of these types, an "Atlantic" or a 4-4-0, and an "A" class 0-6-0 or a 0-8-0 mineral engine!

But to return to the 4.25 p.m. *ex*-Salford, on whose engine footplate I had just mounted, and stowed myself away in a comfortably warm corner by the firebox, on the fireman's side. The engine was blowing off at about 175 lb., before the start, but not a scrap more steam went through the safety valves after Pendleton until we descended Baxenden bank and ran through Accrington. Signals were on at Windsor Bridge, so again we had a poor start, but at Clifton Junction Shorrock threw his regulator right over, and at something between 40 and 45 per cent. cut-off we ascended the 1 in 96 to Ringley Road in fine style, the last ¾-mile being run steadily at 32·7 m.p.h. Steam pressure at the summit was 165 lb. The regulator was now brought back to about one-quarter, and with cut-off unchanged, we touched about 52 m.p.h. at Radcliffe North (I did not catch a milepost here); so matters continued to a point between Summerseat and Ramsbottom, where Shorrock advanced his cut-off to 50 per cent., and again threw the regulator wide, in preparation for the final climb. The effect of this was to advance our speed from 34 m.p.h. to 37 at Stubbins Junction, where cut-off was further and finally advanced to 55 per cent.

Our speed from Bury to Ramsbottom had been slightly lower than on the previous trips, but the effect of Shorrock's conservation of energy was immediately seen in the magnificent ascent we made of the 1 in 78, mile after mile of which was mounted steadily at 29·4 m.p.h. Helm-

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shore crossing caused another momentary slip, but we triumphantly topped the summit at 28·3 m.p.h., with pressure no lower than 160 lb., and between two and three inches of water showing in the "glass"—a simply extraordinary achievement. The steepest part of this bank is an almost exact counterpart of Colyton

Nothing else occurred that was of note; our speed down Baxenden bank at no point exceeded 45 m.p.h.; the Accrington slack was made with all the customary caution; and we had just got above 60 m.p.h. on the drop past Hapton when adverse signals showed, and we were thus prevented from making anything

TABLE B.—L. AND N.W.R. (LATE L. AND Y.R.). MANCHESTER—SOUTHPORT.

Distance.	Run No.:	Schedule.	1	2	3	4	5	6F	7	8	9
	Engine No.:		1418	1399	1525	1510	1519	1519	1510	1506	1506
	Engine type:		4-4-2	4-4-2	4-6-0B	4-6-0R	4-6-0R	4-6-0R	4-6-0R	4-6-0R	4-6-0R
	Load (axles):		20	40	40	40	40	40	44	48	48
	Load (tons tare):		114	272	272	272	273	272	299	330	330
	Load (tons full):		125	295	295	295	295	295	325	360	360
Miles.		min.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
0·0	Manchester ..	0	0·00 p.w.c.	0·00	0·00 sigs.	0·00	0·00	0·00 p.w.c.	0·00	0·00 p.w.c.	0·00
2·4	Pendleton ..	5	4·50	6·00	6·15 sigs.	4·55	4·40	5·00	5·05	5·45	5·15
5·1	Swinton ..	..	9·25	12·05	12·25	9·20	9·05	9·50	9·55	10·20	9·45
7·5	Walkden ..	..	12·35	15·40	16·05	12·15	12·10	12·55	13·10	13·25 p.w.c.	12·50 p.w.c.
11·0	Atherton ..	..	16·15	19·40	20·00	15·55	15·45	16·20	16·45	17·30	16·35
13·5	Dobb's Brow Jc.	19	18·55	22·40	23·05	18·50	18·35	18·50	19·20	20·25	19·35
16·1	Hindley No. 3..	..	21·45 sigs.	25·30 sigs.	26·05	21·45	21·45 sigs.	21·30 sigs.	22·25	23·30	22·45
17·9	Wigan ..	pass	25·10	28·55	pass	pass	pass	pass	pass	pass	pass
		27	26·35	30·15	29·00	25·20	24·55	25·10 sigs.	25·45	27·00	26·00
20·6	Gathurst ..	..	31·15	35·45	33·20	29·05	28·50	30·20 p.w.c.	29·50	31·10	30·10
24·7	Parbold ..	..	35·50	40·40	38·10	33·55 sigs.	33·40	36·00 sigs.	34·10	35·50	34·55
27·8	Burscough Br...	39	38·50	43·45	41·20	37·20	37·00	39·20	36·55	38·50	38·00
30·9	Bescar Lane ..	..	42·05	47·05	44·55	41·05	40·15 p.w.c.	42·25	39·55	41·55	41·15
34·3	St. Luke's ..	47	45·50	50·55	49·15	45·40	44·55	46·10	44·15	46·10	45·35
34·3	Net time (min.)	47	*43½	*48	48¼	44¾	44	42¼	44¼	44¾	45

R—Rebuilt and Superheated. B—As originally built. F—Recorded from the footplate.
* On non-stop basis.

—from Seaton Junction to Honiton Tunnel—on the London and South Western main line, and is 25 per cent. longer than the 1 in 75 up to Shap on the London and North Western main line, in addition to the fact of far harder approach grades, and no opportunity of starting the climb at 75 or 65 m.p.h., as in the two latter cases; yet how often do the giant 4-6-0 engines of the two last-mentioned lines breast these summits with trains of comparable weight at such a speed as this?

better than a punctual arrival. There was no particular interest in the rest of the journey to Colne, which includes stops at all stations, but it is worthy of record that the coal consumption for the complete 34-mile journey from Salford to Colne was about 15 cwt., which works out at a shade under 50 lb. per mile; the large proportion of this by no means immoderate quantity—in view of the extreme difficulty of the route traversed—disappeared into the fire-box before Baxenden summit,

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up to which point Fireman Gough had a strenuous spell of firing.

The remaining trip was one behind a London and North Western 4-6-0 "Prince," which was stationed for a time at Agecroft, and worked chiefly on this train. But it is noticeable that, even with allowance for delays, this was the only journey on which net time was only just maintained, and the work performed was at almost all points inferior to that of the 2-4-2 tanks. At the same time one must take into account the driver's much greater familiarity with the working of the latter Salford-Colne service, which I can recommend as well worth the attention of train-timers, as there are other expresses booked nearly as hard as the 4.25 p.m. out of Salford.

It seemed an extraordinary contrast to mount, on the next day, the footplate of one of the large rebuilt and superheated four-cylinder 4-6-0 engines for a run on the 5.40 p.m. express from Manchester to Southport, which appears in column 5 of the second table. The road in this case is less difficult, though still very far from easy; the ten-coach train, composed of

Photo.] LONDON AND NORTH WESTERN RAILWAY. [*H. R. H. Ward.*
Up Liverpool and Manchester Express, taking water at Bushey.
4-6-0 locomotive, No. 2392, "Caliban," "Prince of Wales" class.

than of the former. Stopped at Windsor Bridge, we attained 40 m.p.h. beyond Pendleton, and then were badly slackened beyond Clifton to 20 m.p.h. at the bottom of the 1 in 96, whence we accelerated to 30 at the top. But at Radcliffe North we were not doing more than 48 m.p.h., and fell to 38 at Bury, 33 at Ramsbottom, and as low as 24½ on the first part of the 1 in 78; yet at Haslingden, strangely enough, we had won back to 29 m.p.h. After Accrington we had a clear road, but never got above 51 m.p.h. at Hapton; the poor rates of speed on the easier sections, as compared with those attained by the tanks, were, indeed, the greatest source of surprise to me on this trip. So much for the heavy corridor stock, totalled nearly 300 tons; but so well was the engine working within her powers that cut-off was never advanced beyond 40 per cent., even for the 2 miles, mostly at 1 in 84 and averaging 1 in 90, from Pendleton up to Pendlebury. This short length, again, was the only one where Driver Turner had his regulator full open; after passing Swinton from two-fifths to one-half open, with a cut-off merely at 25 per cent., served more than amply to maintain time until after Gathurst, after which the regulator was brought back to the one-quarter position. It may be added, as a measure of the engine's capabilities, that this was the "last lap" of the day's journey from

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TABLE C.—L. AND N.W.R. CREWE—CARLISLE.

Distance.	Run No.: / Engine No.: / Engine type: / Load (axles): / Load (tons tare): / Load (tons full):	Schedule.	1 169 4-6-0C 26 187 200	2 857¶ 2-4-0J 26 196 205	3 104 4-4-0G 34 248 265	4F 1511 4-6-0H 34 249 265	5 1349 4-6-0P 44 310 335	6 183¶ 4-6-0C 56 403 420	7 250¶ 4-6-0C 60 436 460	Schedule.	8 150 4-6-0C 52* 348* 375*	Schedule.	9 2101 4-6-0C 42 284 300	Schedule.	10 490 4-6-0P 56† 377† 400†
Miles.		min.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	min.	m. s.	min.	m. s.	min.	m. s.
0·0	Crewe	0	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0	0·00	..	..	..	..
4·9	Minshull Vernon	..	7·10	7·15	7·05	7·25	7·35	7·40	7·30	..	8·10	..	..	..	..
8·8	Winsford Junction	10	10·10 sigs.	11·05	10·50	11·00	11·05	11·40	11·00	11	12·05	..	..	..	..
16·2	Weaver Junction (50 m.p.h.) ..	18	16·45	18·25	17·55	17·35	18·05	18·55	17·45	19	18·45	..	..	..	..
21·2	Moore	..	21·05	23·35	22·35 p.w.r.	22·10 sigs.	23·00 sigs.	23·55	22·20	..	23·10	..	..	..	..
24·1	Warrington (50 m.p.h.) ..	27	23·50	26·35	26·10	25·25	26·35	26·50	25·05	28	25·45	..	..	..	..
27·5	Winwick Junction	31	27·20	30·30	31·20	29·20	31·20	30·35	28·25	33	29·05	..	..	..	..
31·0	Golborne	..	31·10	34·40	35·25	33·05 sigs.	35·40	35·05	32·20	..	33·10	..	..	..	..
35·8	Wigan	40	36·10 sigs.	39·55	40·35	39·00 sigs.	40·40	40·15	37·25	43	39·15	..	..	..	..
39·1	Standish Junction	44	41·10	44·30	44·25	45·25	44·40	44·45	41·40	5	7·15	..	..	..	..
41·6	Coppull	..	45·20	47·40	47·15	48·20	47·45	47·55	45·00	..	10·55	..	..	..	..
45·5	Euxton Junction (60 m.p.h.) ..	52	48·55	51·40	50·45	51·50	51·25	51·25	48·35	13	14·35	..	..	..	..
48·7	Farington	..	51·50	55·10	53·35	54·50	54·25	54·20	51·35	..	17·15	..	..	..	..
51·0	Preston (15 m.p.h.)	59	55·00 sigs.	58·35 sigs.	56·20	57·45	57·35	57·30	55·00	20	20·30	0	0·00	0	0·00
52·3	Oxheys Box	62	58·15 p.w.r.	62·05	58·55	60·15	60·25	60·10	57·40	23	23·15	3	4·40 sigs.	3	5·10
60·5	Garstang	..	68·05	70·45	68·00	68·25 sigs.	69·35	69·50	67·05	..	32·30	..	13·30	..	13·50
67·6	Galgate	..	75·00	78·00	75·10	76·20 sigs.	76·45	77·25	74·05	..	39·40	..	21·25	..	20·55
72·0	Lancaster (50 m.p.h.)	83	79·10	82·25	79·40	81·20	81·05	81·50	78·25	44	43·50	24	26·00	25	25·25
78·2	Carnforth	90	85·10	89·10	86·20	87·45	87·00	87·40	84·50	51	49·40	32	32·00	33	32·00
82·7	Burton and Holme	..	90·15	94·10	91·35	92·25	91·55	92·30	90·30	..	54·45	..	7·25	..	7·40
85·5	Milnthorpe	..	93·00	97·10	94·20	95·20	94·35	95·20	93·55	..	57·40	..	10·20 sigs.	..	10·35
91·1	Oxenholme	104	99·10	104·40	101·20	101·55	101·45	102·20	102·00	67	65·55	17	24·15	17	17·45
98·1	Grayrigg	..	109·05	115·55	111·45	111·40	112·35	113·10	114·45	..	80·10	..	37·10	..	13·35

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104·1	Tebay	..	..	121	115·50	123·10	118·15	117·50	119·15	120·00	121·45	85	87·10	36	44·15	19	19·55
109·7	Shap Summit ..	..	..	130	124·35	134·05	127·45 p.w.r.	125·15	129·50	131·35	133·00	96	100·05	46	54·05	29	30·15
111·7	Shap	..	..	..	127·20	..	131·30	127·40	132·50	134·25	135·50	..	103·10	..	56·45	..	33·00
119·0	Clifton and Lowther ..	..	..	..	134·05	..	139·25	135·05	139·55	141·30	142·30	..	109·30	..	63·10	..	39·40 sigs.
123·2	Penrith (50 m p.h.) ..	..	..	144·	138·30	147·45	143·35	139·30	144·15	146·00	147·00 sigs.	111	113·10	60	66·50	44	45·50
127·9	Plumpton ..	..	..	..	143·40 p.w.r.	152·45	148·30	145·25	149·20	151·50	153·25	..	117·45	..	71·25	..	7·45
136·2	Wreay	..	..	..	151·20	160·00	156·30	152·50 sigs.	156·45	159·10	160·25	..	124·45	..	78·00	..	14·50
141·0	Carlisle	..	..	163	157·45	165·10	162·20	159·10	162·40	164·30	165·40	130	130·30	79	83·20	20	20·10
141·0	Net times (min.) ..	..	..	163	152¼	164¼	158	151	160¾	§164½	§165	173	169¾	111	105	114	114

Thick horizontal line indicates booked stop. Specified slacks shown in brackets in stations column. F Recorded from the footplate.
C 4-cylinder "Claughton" class. P 2-cylinder "Prince of Wales" class. H 4-cylinder Hughes (L. and Y.) design.
G "George the Fifth" class. J "Jumbo" class. * 48 axles = 320/335 tons, Crewe to Wigan.
† 48 axles = 326/345 tons *ex*-Carnforth; 44 axles = 294/310 tons, *ex*-Oxenholme. § Schedule, 168 min.
¶ *Piloted:* Runs 1 and 7, 2-4-0 No. 883; Run 6, 2-4-0 No. 1522.

Southport to York and back, and that the coal in use was small and dusty, despite which Fireman Beardsley had not the slightest difficulty in maintaining steam. Though slightly slacked at the foot of the bank, we mounted to Swinton at a minimum rate of 32 m.p.h., and then touched 56½ m.p.h. at Walkden troughs, and 67 at Atherton "dip"; after that, as it was quite dark, I was unable to record any speeds, but it is certain that we were going well over 60 m.p.h. through Bescar Lane. Allowing for the various delays, the net gain to engine was nearly 5 min. Gradients, it may be added, are of a sharply undulating character all the way from Swinton to ½-mile beyond Gathurst, after which the road is favourable to westbound trains, with a gradually falling tendency on to Southport, the principal descent being 1¾-miles at about 1 in 200.

Very brief comments will suffice for the other runs. No. 1510 (column 4), driven by Shorrock, touched 45 m.p.h. at Pendleton, mounted Pendlebury bank at a minimum of 33 m.p.h.—one of the two best ascents of the series—but then, after reaching 57½ m.p.h. at Walkden and 61½ at Atherton, took things quite easily. A clear road enabled us to pass Wigan 1¾-min. early, and even after the slight check at Hoscar and very leisurely subsequent running, we were 1¼ min. early. No. 1519, in column 6, made the best start of the series, with 45 m.p.h. at Pendleton and a minimum as high as 34½ m.p.h. at Pendlebury, after which came maxima of 55 at Walkden troughs and 65 at Atherton, before the usual dead slowing from Hindley No. 3 to beyond Wigan, complicated in this case by a signal check. We were through Wigan, however, 2 min. early, and despite unhurried progress beyond Parbold, and a concluding p.w. check, succeeded in finishing 2 min. early.

The runs with the three heavier loads were timed during the recent coal dispute period. No. 1510, Driver Rigby, of Southport shed, found no difficulty with an eleven-coach train; we touched 43 m.p.h. at Pendleton, fell to 30 at Pendlebury, and reached 54 at Walkden and as much as 67 at Atherton. After Wigan there ensued some very fine running—the best of the series—the time of 5¾ min. for the 6·2 miles from Parbold to Bescar Lane, with its maximum of 69 m.p.h.,

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being excellent. In actual time, this undelayed run was the quickest of the series, and we arrived 2¾ min. early. With the 360-ton loads, No. 1506 on both occasions did well; maxima at Pendleton were 40½ after the check, and 43 m.p.h., and minima at Pendlebury 32 and 33 m.p.h.—both notable figures after such an ascent with this twelve-coach train—while the maxima at Walkden were both 55 m.p.h., and at Atherton, where we were slightly slowed, 58 and 61 m.p.h. respectively. We crawled through Wigan on both runs—the average speed of transit here on all trips was, indeed, nearer 15-20 m.p.h. for a full half-mile than the 30 m.p.h. shown in the "rubric"—but attained 65 m.p.h. on both at Parbold, the first of the two trips showing the best subsequent maintenance of speed. The two arrivals were thus nicely before time; in fact, time was bettered on each of the six runs I have made behind these fine engines on the Southport service, the average net times working out at a shade over 44 min., and probably little difficulty would be occasioned for the engines if the times of these crack trains from Manchester to Chapel Street were reduced from the present 51 min. to an even three-quarters of an hour.

By comparison, both the "Atlantic" No. 1399 and the 4-6-0 No. 1525, in columns 2 and 3, failed in pre-superheat days to keep even net time with a ten-coach train, and their times, after allowing for delays, fell some 4 min. behind the average of the preceding trips, despite the shortness of the journey. No. 1399 was stopped in Wigan station by adverse signals. Run No. 1 was made on the 7.5 p.m. down, which makes the same time to Southport as the 5.0 and 5.40 p.m. down non-stops, inclusive of 2 min. standing at Wigan, but is lightly loaded. Allowance to Wigan is only 24 min., which No. 1418 did not quite observe, but the 16·4 miles from Wigan to St. Luke's were smartly run in 19¼ min., start-to-stop—a gain of 1¾ min.

Photo.] LONDON AND NORTH WESTERN RAILWAY. [*Henry L. Salmon.*

Up Liverpool and Lake District Express. Locomotives: 4–4–0, No. 2164, "Oberon" (Rebuilt "Precursor" class); and four-cylinder 4–6–0, No. 2427, "Duke of Connaught."

I have no record of the working of any London and North Western engines on these Southport trains, or on the Blackpool service, but I found a 4-6-0 "Prince"—No. 325—very much at home the other day on one of the 45-min. trains from Liverpool to Manchester, with a load of four corridor eight-wheelers and a twelve-wheeled "diner," weighing 147 tons empty and 155 tons full. We passed Fazakerley, 5 miles, in 7 min. 40 sec., Rainford Junction, 12 miles, in 14 min. 35 sec.—having

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maintained an average of over 60 m.p.h. up 6 miles mostly at between 1 in 200 and 300—and Orrell, 15·5 miles, in 18 min. 55 sec., minimum rate on the last 2½ miles at 1 in 116–125 to the tunnel being 43½ m.p.h. Down the succeeding descent and through Pemberton Junction we ran very cautiously; the latter, 17·3 miles, was passed in 21 min. (1 min. early), and we mounted the 1 in 95 to Crow Nest at a minimum of 40 m.p.h., passing Dobb's Brow Junction, 22·9 miles, in 27 min. 55 sec., 2 min. early. The allowance of 10 min. for the next 11·1 miles to Pendleton is tight, and so, being early, we took things easily: Atherton, 25·4 miles, was passed in 30¾ min., at 68 m.p.h.; Walkden, 28·9 miles, in 34 min. 10 sec.; Swinton, 31·4 miles, in 36 min. 35 sec.; and Pendleton, 34·1 miles, in 39 min. 25 sec.; by which it will be seen that we were averaging just above the mile-a-minute rate most of the way. Signals through Salford delayed us, but we finished the 36·4 miles into Manchester in 43¾ min., or 43 min. net—a satisfactory performance.

Photo.] LONDON AND NORTH WESTERN RAILWAY. [*F. E. Mackay.*

Liverpool and Manchester West Coast Express. Four-cylinder 4-6-0 locomotive, No. 2101, "Claughton" class.

Last of all, we come to the runs from Crewe to Carlisle, detailed in Table C. Here I was enabled still further to follow up the working of the large Lancashire and Yorkshire superheated four-cylinder 4-6-0 engines, by the courtesy of Mr. F. W. Dingley, Superintendent of Motive Power of Division "A" of the London and North Western Railway, who kindly arranged for one of them to work the 1.15 p.m. non-stop express from Crewe—the Glasgow portion of the 10.0 a.m. *ex*-Euston—and allowed me to travel on the footplate. This run appears in column 4, the engine concerned being No. 1511. By way of comparison, recent runs on the same express are detailed in adjacent columns behind a "Claughton" (1), two 2-4-0 "Precedents" or "Jumbos" (2)—a singular experience in the year of grace 1922—a 4-4-0 "George the Fifth" (3), and a "Prince" 4-6-0 (5); after that come two piloted "Claughton" runs with the old undivided train, of tremendous weight and allowed 5 min. more to Carlisle than at present; then comes a heavily loaded "Claughton" run without a pilot on the 7.30 p.m. Highland express out of Euston; and the table concludes with two trips on Liverpool and Manchester West Coast expresses—one "Claughton"-hauled, on the 1.32 p.m. out of Preston, and the other, "Prince"-hauled, on that express of abnormally tight timing in relation to load hauled, leaving Preston at 6.18 p.m. The series thus gives a thoroughly representative selection of workings behind

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every type of engine used, and several varieties of bookings.

Selection has been made of the timing points which figure in the table in such a way as to mark all the principal changes of gradient, and also the speed at which various stations and junctions were passed *en route*, where speed is restricted or is generally slightly modified — Weaver Junction, Warrington, Euxton Junction, Farington through to the north end of Preston, with a subsequent recovery up 1 in 95, Lancaster Junction to Lancaster, and Eamont Bridge Junction to Penrith.

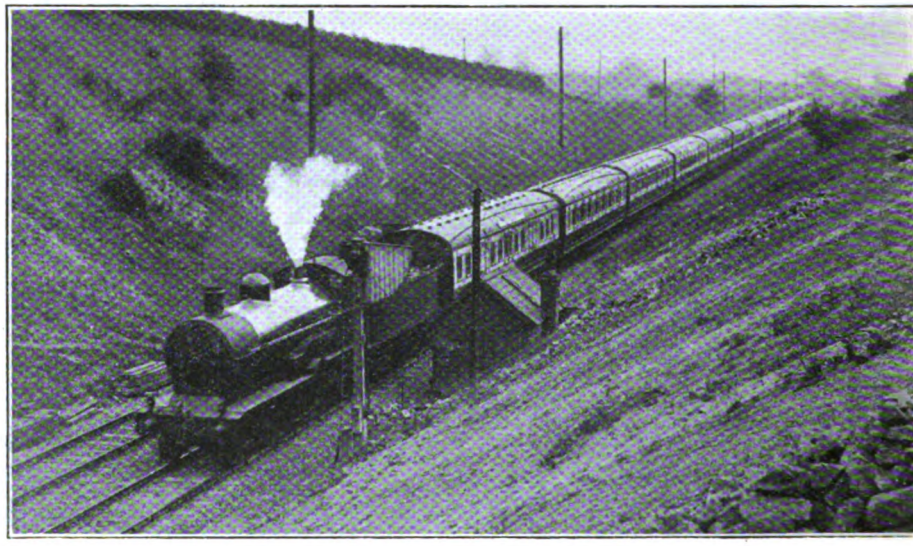

Photo.] LONDON AND NORTH WESTERN RAILWAY. [*Leslie L. Thompson.*

Liverpool and Manchester express approaching Hunsbury Hill Tunnel, Northampton.
4-4-0 locomotive, No. 1623, "Nubian," "George the Fifth" class.

Timings are, as will be seen, very much on the easy side out to Preston, and all runs were well on the right side of time to this point, drivers seeking obviously to get a little time in hand in order to offset the severe demands made on the engines from Carnforth up to Shap Summit. Some of the sectional timings, however, are absolutely impossible of achievement. One wonders how an engine of any type whatsoever can be expected to move a 375-ton train from a dead start at Wigan on a 1 in 150 up grade (even when assisted, as we were, out of the platform), up an ascent of 3·3 miles to Standish, which includes 1¾ at 1 in 104, in 5 min., *vide* column 8. Or Preston to Oxheys, again, with a heavy train, 1·3 miles from the start, commencing at 1 in 95, in 3 min.—the same allowance as for pass to pass—is another "counsel of perfection." *Vide* columns 9 and 10. And again, the 6.18 p.m. out of Preston, with 345 tons out of Carnforth, is expected to run the 12·9 miles to Oxenholme, start-to-stop, including 2½ miles up at 1 in 134 just after the start, and 6 miles continuously at an average of 1 in 180 from Milnthorpe onwards, in 17 min. The time of 17¾ min. made by No. 490 in column 10, indeed, is in my judgment one of the finest achievements in the whole table.

In dealing with the runs *seriatim* I shall be compelled, owing to considerations of space, to content myself with the briefest reference to their leading features. Run No. 1 followed on a late arrival at Crewe, so that we started 16 min. behind time. Given a clear road, our driver would, I believe, have left very little of this time unrecovered, but the succession of checks was discouraging. The start out of Crewe was the fastest I have ever known here; in five level miles to Minshull Vernon we had got up to 68 m.p.h.; this increased to 71½ at Winsford, and no less than 77½ on the 1 in 400 before Hartford, but

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signals brought us down to 60 at Acton Bridge. At Moore, travelling at 71½ m.p.h. again, we were inside "even time"; at Warrington, with over 3 min. regained, we "eased" to 60; then we topped the 2 miles' ascent, mostly at 1 in 132–156, to Golborne Junction at a minimum of 52, and attained 62½ on the subsequent level stretch before passing Wigan in 3¾ min. under the time allowed. Owing to delays, nothing else of note occurred till after Garstang, where we worked up to 65 m.p.h. on slightly rising grades, but eased to 58 through Lancaster.

The run with the two "Jumbos" in column 2 disappointed me. They should by rights have played with this modest load, equal to 100 tons apiece, but instead of this, they made the only one of all the runs I have timed on this express since its acceleration on which time went against the engine. Excessive caution was shown at all speed-reduction points, so that, unchecked, we were only just on time at Preston; after that they lost badly from Carnforth to Summit—to the tune of 5 min.—the minimum rate at Grayrigg being 33 m.p.h., and at Shap Summit

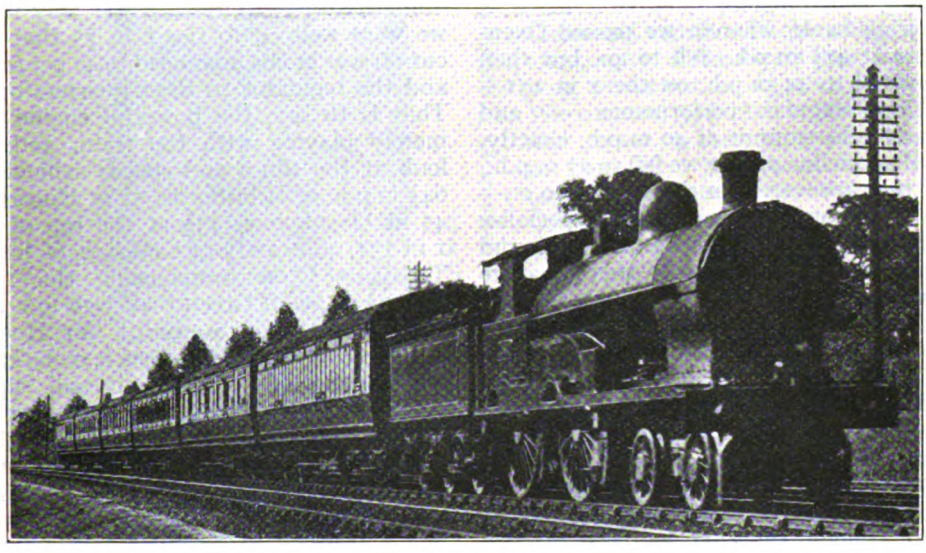

Photo.] LONDON AND NORTH WESTERN RAILWAY. [*F. E. Mackay.*

Up Birmingham Two-hour Express. Superheater 4–4–0 engine, No. 882, "Canada."

On the 1 in 134 after Carnforth the minimum rate was 47 m.p.h.; touching 64½ at Milnthorpe, we passed Oxenholme at 48½, maintained 43 to the top of the 1 in 131 of Grayrigg bank, and topped the remaining two miles at 1 in 106 at a minimum of 36 m.p.h.; reaching 61½ m.p.h. at Tebay, we then went up the 4 miles at 1 in 75 at a sustained minimum of 31 m.p.h., save for a sudden fall to 28 on the level at the summit through premature notching up. Descending to Carlisle, 70½ m.p.h. was the highest speed reached before Penrith, and 74 afterwards. It has been difficult to estimate the net time on this smart trip, but the 152¼ min. shown—10¾ min. below schedule—is, if anything, too high a figure rather than too low.

25½ m.p.h. Beyond Summit we were not allowed to exceed 69 m.p.h. before Penrith, nor 70½ on the tempting subsequent descent, and so regained only 2 min. from the liberal allowance over this concluding length.

No. 104, *Leamington Spa*, made some fine running in Column 3, with a considerably heavier train. Beyond a brilliant start to Minshull Vernon, nothing of note occurred until we had passed Wigan—slightly behind time owing to an exceedingly bad check right through Warrington—but between Wigan and Preston an amazing effort was made, which easily carries off all the honours in the table over this length. Passing Wigan at exactly 60 m.p.h., we mounted the 1 in 104 to

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Boar's Head at a minimum of 49 m.p.h.; then we *attained* 56½ up 1½ miles at 1 in 366—in itself an extraordinary feat—after which the last mile at 1 in 242–119 to Coppull Summit brought us down to 52½ m.p.h. I have never recorded times anywhere approaching these up this particular bank. Dropping to Preston we touched 72½ m.p.h. before, and 71½ after Euxton, with a slack to 60 over the junction; so we covered the 15·2 miles from Wigan to Preston in 15¾ min., instead of the 19 min. allowed. After this epoch-making effort we went more moderately on to Carnforth, though still gaining time; a fine ascent was made of Grayrigg bank, wherein we passed Oxenholme at 41½ m.p.h., fell to 40, but then recovered to 44 m.p.h. on the 1 in 131—another singular performance — and breasted the summit at 40 m.p.h. exactly. On Shap incline proper we fell to 27 m.p.h., and then recovered on the 1 in 75 to 29—this driver and engine appear to specialise in the exceptional—before a final minimum of 26 m.p.h., again owing to premature notching up. A very cautious descent to Carlisle, complicated by a p.w.r. check, concluded the run.

This brings me to my trip with Driver J. Hardstaff and Fireman C. Lewis on No. 1511, recorded in Column 4. We got away in good style, passing Minshull Vernon at 65 m.p.h., and sustaining 70½ from Winsford to Hartford; slacking to 60 at Weaver Junction, we then reached 72½ m.p.h. at Moore, and went over the Ship Canal "hump" at 64½, after which came a very severe signal check through Warrington. From this a very smart recovery was made, speed at Golborne Junction, after the rise from Winwick, being as high as 53½ m.p.h. Before Wigan we had attained 65 m.p.h., but then came a terrible string of signal checks, whereby we were forced to crawl from signal to signal all the way through Wigan. Before Euxton we reached 72½ m.p.h., and then went easily on to Preston. The remarkable speed capacity of the engine was well displayed after we had recovered from Preston slack, as on the very slight fall from Barton to Brock, with reverse merely at 20 per cent. and regulator about one-quarter open, we accelerated with ease to 69 m.p.h., and achieved considerably the fastest time of the series from Oxheys to Garstang. Then came signal checks again—to 40 m.p.h. at Scorton and to 30 at Lancaster Junction, despite which we were still in advance of time as we passed Lancaster. After that, we did at last get a clear road, which Driver Hardstaff signalised by gaining no less than 4 min. from Lancaster to Shap Summit.

And this is how it was done. From Carnforth to about Hincaster Junction we were working at 20 per cent. cut-off; from there right up to the beginning of the 1 in 106, which forms the last two miles of Grayrigg bank, at 25 per cent.; and then up the 106 at 30 per cent., the regulator being never more than two-fifths open. Similarly up Shap itself, it was only when we were well on to the 1 in 75 that the cut-off was at last advanced to 40 per cent., and the regulator to three-quarters open. That is to say, the powerful engine was merely playing with the train, and yet look at the times and speeds achieved—64½ m.p.h. at Milnthorpe, 51 at Hincaster, 45 at Oxenholme, 43½ at the top of the 1 in 131, 40 exactly at Grayrigg, 66 before Tebay, 58½ on commencing the 1 in 75, 43½ at Scout Green (half way up), and 36½ m.p.h. at Shap Summit! Mr. Hughes is to be congratulated on such remarkable results, since he has rebuilt and superheated these engines, and I fancy we are destined to hear a good deal more of their prowess when, as is now foreshadowed, the type is further multiplied and is in general use on the North Western main line. From Shap Summit, being now nearly 5 min. early, we simply ambled down to Carlisle—so much so, indeed, that in the course of 31 miles' travelling Fireman Lewis only found it necessary once to touch the fire. Again it has been difficult, with so many delays, accurately to estimate the net journey time, but the allowance made, which leaves us a net gain of 12 min. from Crewe, is certainly not excessive.

The run in column 5 shows a "Prince" at his best, with a really substantial load. Nothing of exceptional note was done until we were through Carnforth, where, despite the bad slowing through Warrington, we had 3 min. in hand; from Carnforth I consider it a fine achievement that an engine of such moderate dimensions should lose barely 3 min. to Summit with a load as heavy as 335 tons. We passed Milnthorpe at 60 m.p.h., Hincaster at 44, Oxenholme at 42½, the top of the 131 at

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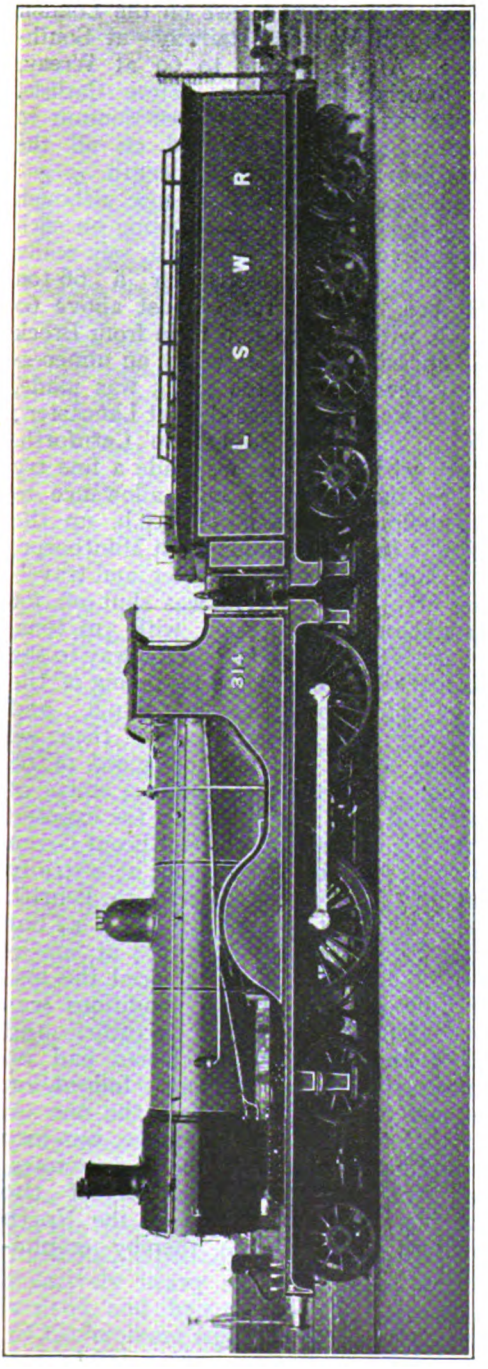
39½ and Grayrigg at 34½; 60½ was the maximum rate attained before Tebay, and then we fell to 29½ at Scout Green, and, by a rapid subsequent fall—the engine probably running a little short of steam—to 20½ at Summit. From Summit, being on time, we did not hurry to Carlisle, although a momentary maximum of 75 m.p.h. was reached at Southwaite.



LONDON AND SOUTH WESTERN RAILWAY.
4-4-0 "Drummond" Locomotive, fitted with new boiler and "Eastleigh" superheater.

The two runs in Columns 6 and 7, featuring "Jumbo"-piloted "Claughtons" on the old undivided train, with 5 min. extra allowed to Carlisle, are really complementary to each other, the second showing a very rapid start, with over 5 min. gained to Carnforth, while the first contained by far the better work from Carnforth up to Summit. A summary of the best times from the two runs, indeed, gives a total of 159 min. 20 sec. from Crewe to Carlisle. Of the whole table a summary of the best times, by the way, works out at 23 min. 40 sec. to Warrington, 35¾ min. to Wigan, 51 min. 20 sec. to Preston, 73 min. 10 sec. to Lancaster, 79 min. to Carnforth, 92½ min. to Oxenholme, 102¼ min. to Grayrigg, 108 min. 25 sec. to Tebay, 115 min. 50 sec. to Shap Summit, 128¼ min. to Penrith, and 145 min. 35 sec. to Carlisle—17½ min. less than the time allowed! On Run 7, we passed Winsford at 69 m.p.h. and Moore at 70½; fell to 57½ at the Ship Canal Bridge, passed Warrington at 65, Winwick at 61, and Golborne Junction at 50½; after which we touched 60 beyond Bamfurlong and mounted Boar's Head bank at a minimum of 41½ m.p.h. No. 6 run then comes in, with a maximum of 72½ m.p.h. before Euxton, and of 67 at Farington; the latter falls behind from Preston to Lancaster Junction, but then comes to the fore again with maxima of 69 at both Lancaster and Hest Bank. Then follows quite a good ascent of Grayrigg bank on No. 6 run, with a sustained minimum of 40 m.p.h. on the 1 in 135, and one of 33½ at Grayrigg station; but Shap itself was ascended in more leisurely fashion. Very moderate descents were made in both cases to Carlisle, time being well in hand on the 168 min. allowed.

Run No. 8, behind a heavily-loaded "Claughton" at night, was a curious trip. It opened with a tremendously rapid "snippet" to Wigan, wherein we passed Hartford at 67 m.p.h. and Moore at 74; only fell to 64 at the Ship

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Canal and passed Warrington at 67, Winwick at 57½ and Golborne Junction at 48½; but for the crawl into Wigan we should have stopped in under 39 min., and as it was we arrived 3¾ min. early, having started on time. Banked in rear out of the platform at Wigan, we attained 29½ m.p.h. at Boar's Head, and reached maxima of 70½ and 71½ m.p.h. on the two stages of the descent from Coppull to Preston. Most of the way from Barton to Lancaster, on slightly adverse grades, speed was maintained at about 61 m.p.h., with an increase to 70½ on the short descent past Lancaster station. But then there followed a distinctly poor climb to Shap, with minima of 29 m.p.h. at Grayrigg and 16½ m.p.h. at Summit; high speed from Shap to Carlisle, with mile after mile at 75 m.p.h. near Clifton, and a maximum of 77½, and then further maxima beyond Penrith of 76½ m.p.h. at Southwaite and 75 beyond Wreay, did not quite suffice to recoup the loss. We should have been in on time, however, but for the ½-min. dropped by a very slow stop.

There was some fine running embodied in "Claughton" No. 2101's trip in column 9, again with a substantial train. The signal check at Garstang was a severe one, but on the slight subsequent up-grades we worked up to 61 m.p.h., and then passed Lancaster at 71½ m.p.h., keeping time to Carnforth despite a full 2 min. lost by the delay. Worse was to follow, however, as we were brought to a dead stand by signal at Sedgwick, between Hincaster and Oxenholme, for 3 min. 55 sec., a delay which I estimate to have cost rather over 8 min., in view of the location of the stop, on Grayrigg bank. So our whole climb to Summit was badly hampered, although the loss on schedule from Oxenholme, passed slowly, to Summit was only 50 sec. Then came a truly joyous old-time sprint down to Carlisle, justifiably high speeds being run with a view to the recovery of time; and I would say again, as previously, that the travelling, over a line super-elevated for such fast running, was distinctly more smooth than it is frequently at the lower speeds generally affected. At the necessary points, such as Penrith, the rate was, of course, suitably reduced. From Shap down to Clifton speed ranged mostly round 70 m.p.h. and from there to the slack for Eamont Junction round 75, with a maximum of 76½; then we reached 75 again at Calthwaite, and 82—my first post-war "80" anywhere north of Crewe on the London and North Western Railway—at Southwaite. After slacking to 60 at Wreay, we touched 75 again before Carlisle. So we regained 3¾ min. from Summit to Carlisle, and easily carried off all the records in the table for this length.

Run No. 10 is included because, although no time was gained, the running on such timings and with such a load, was really of extraordinary merit for a 66-ton "Prince." Speed ranged just above 60 m.p.h. with this 400-ton train from Brock to Lancaster Junction, where an unnecessarily severe reduction to 45 was made, so that we did not exceed 65 at Lancaster; but 1 min. was gained to Carnforth. Then, with 345 tons, we made a fine try at the impossible 17 min. allowance to Oxenholme, attaining 38 m.p.h. up the initial 1 in 134, touching 60 at Milnthorpe, only falling to 52 at Hincaster, and travelling at 45 when steam was shut off for Oxenholme. From there, with 310 tons, we accelerated gradually all the way to the viaduct which marks the beginning of the 1 in 106, crossed at 39½ m.p.h., and Grayrigg was passed at 36; then we worked up to the unusual speed of 66 m.p.h. at Tebay, and despite a storm of wind and rain, keenly felt on the exposed stretches of the bank, passed Scout Green at 27 m.p.h. and the Summit at a steady 22½ m.p.h. On the descent to Penrith we at no point exceeded 70½ m.p.h., but after Penrith we got up to 77½ at Southwaite. That the gains balanced the loss of time in such difficult conditions was very creditable to Driver Carruthers and his fireman, with whom I had had no conversation before starting. Indeed, on no one of these trips, save the one on which I travelled on the engine, was any communication made to the engine crews, and the consistent character of the running over this section of the North Western main line is thereby emphasised.

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"Control" in Railway Traffic Working.

In view of recent innovations, it would appear probable that future railway operation will be supervised on a most intensive form by means of a comprehensive system of "Controls."

By CHARLES TRAVIS, M.Inst.T.
(Joint Author of "Practical Railway Working," "Railway Operating Economics," etc.)

IN the development of improved methods of railway traffic working it is always good advice to "make haste slowly." Proposed schemes require to be considered, the full potentialities sifted, and their relationship with other operating aspects fully established before it is desirable to introduce them as permanent measures. This is a truism which is applicable to most phases of business activity, but it has a particular reference to the railway industry, where the various phases of work are so interrelated that alterations in the methods adopted in one section usually have a direct influence on the methods most suitable for another.

I have introduced my subject in this way in order to indicate that, while control working on certain lines, and that of a most comprehensive character, has proved highly successful, it by no means necessarily follows that even on a less extensive basis it would be an unmixed blessing on others. The prevailing conditions, traffic and otherwise, of the various lines have a vital bearing on the subject, and it is this, primarily, that leads in this country to the traffic working on one system being definitely controlled from a central point, while on others only portions of the line are brought under direct surveillance in this manner.

Probable Extension of "Control" Working.

It must, of course, be clear that the war has exercised a retarding effect—how great is, perhaps, not fully realised—on the development of improved operating methods, especially in those cases where relatively heavy initial expense was involved, and since the war the continuance of Government control and the subsequent introduction and development of the grouping scheme have been by no means productive of progress. Once the various companies comprising the various groups are welded into the large amalgamated companies, however, it is certain that there will be strenuous endeavours made to effect operating economies, and it is probable that this will lead to the extension of control schemes on a wide basis. Control schemes in this connection, I may add, are not confined to the more generally known method of supervising train and traffic movements on the line, but include also systems whereby goods station functions, and the work involved in the collection and delivery of traffic, are brought within the orbit of the "all-seeing eye"—the telephonic control system.

To progress from the general to the particular, let me take the new North Western, Midland and West Scottish Group—to be known as the London, Midland & Northern Railway—as an example to illustrate my argument. In that group are two companies, the Midland and the old Lancashire & Yorkshire, which have comprehensive control schemes in operation, both these—working on somewhat different lines, it is true—exercising a direct supervision over the whole of the traffic operations along the line. Additionally, the Lancashire & Yorkshire had a specialised form of control in connection with the regulation of high-density holiday traffic (described in the August, 1920, issue of the Railway Magazine), while the Midland, which for years past has had a most effective system of control in operation in connection with London cartage, has recently introduced a control system for the more effective working of their large goods stations—a control which, it should be added, is able to co-ordinate on the best basis the cartage and the goods depôt

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handling operations. This, incidentally, will be the subject of an article in a subsequent issue. Proceeding further, I should point out that the London & North Western Company has not been backward in developing train control, nor has the Caledonian, and while in neither case is there such a complete scheme as that in operation on the Midland system, described in the October, November and December, 1921, issues of the RAILWAY MAGAZINE, the former has many districts operated by means of control, while the latter has an extensive and effective scheme in connection with mineral traffic, and a modified scheme in connection with its general freight traffic.

LOGICAL DEVELOPMENTS.

What is the logical outcome of all these schemes? Firstly, it is certain that, with the possible exception of sections with extremely light traffic, all the 7,000 miles comprising the system of the new company will in the course of time be brought under control working. But will it stay at this? Is there not a possibility that the successful working of the goods station control scheme on the Midland Railway will lead to an extension of this to all the large stations on the combined system? And, if that, why should it not be practicable to rope in the smaller stations, these not necessarily having anything more than a local standing, and, consequently, being covered by the district control?

Explained more clearly, what is to prevent the development of a control system to supervise directly the whole operation of the railway, line working, terminal handling and cartage arrangements? It is, of course, obvious that this could not be effected in a few weeks or even in a few months, but it seems to me that there is no insuperable difficulty to the establishment of a control scheme (in connection with each large system) that will enable the whole of the railway operations to be regularly under review —the result being that, if the right men are introduced to work the scheme, extensive economies should result.

Let me further elaborate the position in the event of such a scheme being introduced on the London, Midland and Northern system. It would, of course, first be necessary for a complete system of telephonic circuits to be installed, and while this would involve a large amount of money, the initial cost would speedily be recovered by means of the savings which, in my opinion, could be effected. Having introduced the telephonic facilities, it would become necessary to establish district control offices, these being staffed with men thoroughly familiar with the conditions in the particular area, both on the "traffic" and "goods" side as at present organised. Then divisional control offices, exercising wide powers of discretion in regard to detail matters, would be established, and, speaking generally, the chief of such an office would virtually be the operating superintendent of the division. Finally, in conjunction with the general superintendent's department, assuming the organisation of the grouped system was centralised, there would be a Central Control office.

THE ADVANTAGES TO BE GAINED.

Imagine the advantages to be derived from such an arrangement. In the first place, the Central Control, with its train office, would prepare all train timings in the initial phases, and, after consultation with the divisional and district offices, publish them in the ordinary way. Here, incidentally, is one avenue of economy. Secondly, the central office would essentially be regarded primarily as a "Court of Appeal" in connection with operation, and would, therefore, be kept free to deal adequately with such questions as were referred to it. The controller-in-chief, or operating superintendent, would by means of telephonic conferences held each day with the divisional controllers (who would similarly have held conferences with the district controllers) obtain definite knowledge of the conditions on all parts of the line, and thus be in a position to equate "demand" and "supply" and make adjustments where necessary. He would also be in a position to give prompt and reliable information to the general superintendent on all important questions —promptitude being essential for effective working.

It will, of course, be appreciated that this new form of control would definitely embrace both line operation and goods station working. The latter has an extremely important bearing upon the

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effectiveness of the former, and must of necessity be brought into the scheme. There need be no difficulty about this, however, as the controller at each large goods station would report directly to his district controller. The advantages from the freight traffic point of view would be tremendous. Congestion and its attendant loss of efficiency would be a thing of the past, and the restriction circular in its present form, which, I contend, has outgrown its utility, would be abolished. Where regulation was necessary this would be effected by means of cards from the divisional offices, which would keep the central office advised thereof, in order that all stations concerned might be acquainted with the position.

A More Intensive Form of Supervision.

This subject of control in connection with future railway working under the grouping system might well be elaborated at great length, but I am reminded by the Editor that this—a late contribution—must be restricted to two pages. Consequently, I must defer further elaboration to a subsequent article. Meanwhile, I would say that, in my opinion—and I am speaking from a fairly wide knowledge of the various control schemes in operation, of goods station management and working, and of the prevailing methods of line operation—the potentialities of control are boundless. We are at the moment only in the infancy stage. When the child blooms into maturity, I make bold to claim that British railroading, so far as it affects the working of traffic, will be controlled from the despatch by the consignor to the receipt by the consignee. This need not necessarily mean that there will be any check upon the initiative of those engaged in the actual handling of the traffic, for a system of control, to be thoroughly effective, must be more in the nature of an advisor than a dictator—a point specially emphasised by Mr. Arthur Watson, General Manager of the London & North Western Railway, in a recent lecture to the members of the Institute of Transport.

A final word. Control is beneficent and not tyrannical, and in an article on goods station control which I propose to contribute to an early issue of the Railway Magazine I shall hope to include extracts from the commendatory reports of the district officers who, of all railwaymen, are most directly affected by the development of "control" on a wider basis.

A BRITISH LOCOMOTIVE IN PALESTINE.

Photo.] **LONDON & SOUTH WESTERN RAILWAY 0-6-0 LOCOMOTIVE No. 168.** [*J. R. Goggs.*

Used by R.O.D. during the war and since transferred to the Palestine Railways. Fitted with extended smokebox.

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LONDON AND NORTH EASTERN RAILWAY.

Photo.] [*Elliott & Fry.*

MR. R. L. WEDGWOOD, C.B., C.M.G.,
Chief General Manager.

Photo.] [*J. Russell & Sons.*

SIR FRANCIS DUNNELL, BART., K.C.B.,
Chief Legal Adviser.

(These appointments will become effective from January 1, 1923.)

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Denbigh Hall to Rugby in 1838.

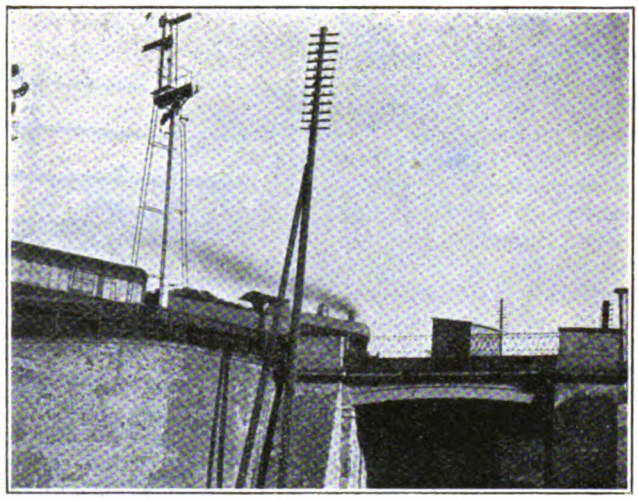

Photo.] [*Chas. S. Lake.*

AN UP EXPRESS PASSING OVER DENBIGH HALL BRIDGE.

ON page 410 of the RAILWAY MAGAZINE for June, 1921, there appeared a "Pertinent Paragraph" dealing with the interesting subject of passenger conveyance between London and Rugby in the year 1838 and prior thereto. Up to that year the London and North Western, or as it then was, the London and Birmingham Railway, terminated at Denbigh Hall, about 1½ miles north of Bletchley, Bucks, and at this point, as stated in the paragraph referred to and in subsequent references to the same subject, passengers transferred from the railway to the road, and were conveyed to Rugby by coaches, there rejoining the railway and proceeding by train to Birmingham.

To commemorate the fact that traffic was dealt with in this manner prior to the linking up of the southern and northern portions of the London and Birmingham Railway, an inscription was cut in one of the buttresses on the south side of the bridge at Denbigh Hall in 1920, the wording of which was given in the "Pertinent Paragraph" above referred to, whilst some details of the route taken by the coaches were provided by the courtesy of the London and North Western Railway, Publicity Department, and Mr. J. W. Wickes, Stationmaster at Bletchley. For the convenience of readers the wording of the inscription is repeated herewith, and we are enabled to illustrate, by means of a sketch recently made on the spot by Mr. R. A. Lake, at present serving a pupilage in a London studio of commercial art, the portion of the bridge on which the inscription appears, with a small photograph showing an express train passing over the structure, which latter spans the main London-Birmingham-Holyhead road. The inscription reads as follows :—

PRIOR TO SEPTEMBER, 1838,
THE SOUTHERN PART OF THIS RAILWAY
TERMINATED AT THIS BRIDGE,
WHENCE PASSENGERS WERE CONVEYED BY
COACH TO RUGBY,
WHERE THEY REJOINED THE RAILWAY FOR
BIRMINGHAM.

INSCRIBED BY
SIR HERBERT LEON, BART., AND LADY LEON,
OF BLETCHLEY PARK, BUCKS,
BY PERMISSION OF THE LONDON & NORTH
WESTERN RAILWAY COMPANY,
AUGUST, 1920.

The bridge at Denbigh, as now existing, carries the four main line tracks of the London and North Western Railway, which, immediately south of the structure,

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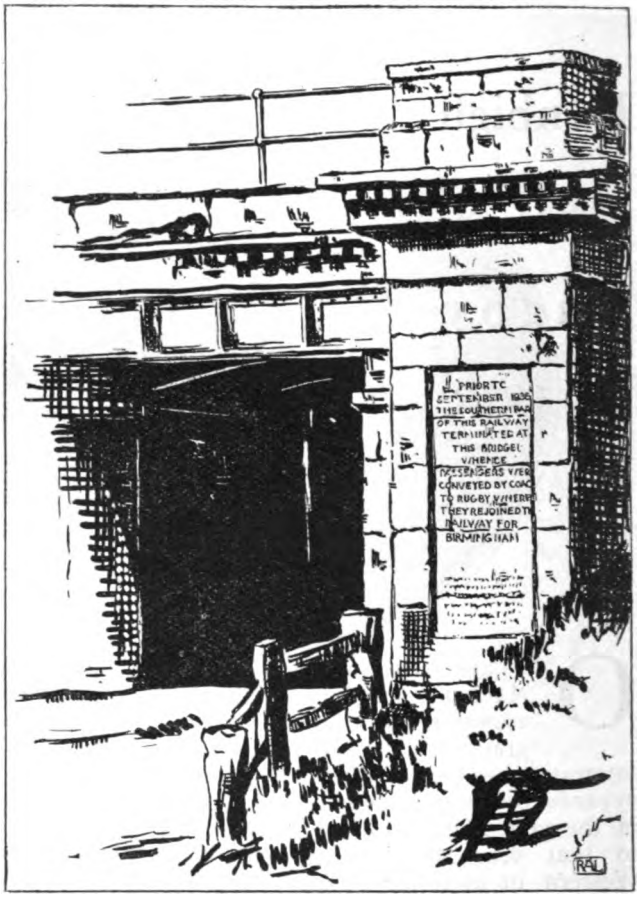
are extended by the addition of a fifth road used by goods and mineral trains which stop at Bletchley for purposes of wagon examination. The bridge, with its abutments, is a very solid example of masonry—in fact, almost a short tunnel, and only recently the writer witnessed the simultaneous passage over it of four trains, whilst below competing traffic in the form of two pleasure motor cars and three motor lorries happened to be passing underneath. Thus the spot, although immediately removed from anything in the shape even of a hamlet, being about midway between the villages of Shenley and Loughton on the northern side and the small township of Fenny Stratford on the southern side, can be rightly classified as a busy spot from the traffic point of view. The historical interest associated with it is very great, not only because of its being identified with a stage in the history of the London and North Western Railway, but also for the reason that two, to some extent, competing streams of traffic here cross one another.



SKETCH OF THE PORTION OF DENBIGH HALL BRIDGE ON WHICH THE INSCRIPTION APPEARS.

C. S. L.

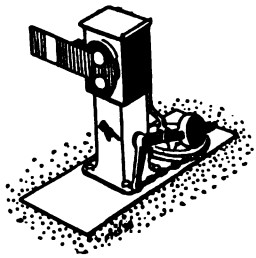


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Photo.] C. DE FER DU NORD. [*W. H. C. Kelland.*

Four-cylinder compound 4-6-2 locomotive, No. 3.1154, on Paris-Boulogne express.

French Express Train Services in 1922.

By "VOYAGEUR."

IN repairing the ravages in long-distance train services occasioned by the European war upheaval of 1914–18, Continental countries have, in the nature of things, considerably more leeway to make up than the railways of this country, in order to re-attain pre-war standards of speed and comfort. That the French railways have been prosecuting this post-war recovery no less energetically than ourselves is evident from a study of the current French time-tables. The French recovery has been in no way assisted by competitive conditions, for the reason that, as is well known, each of the six great French lines—the Nord, the Est, the Etat, the Paris-Orléans, the Midi and the Paris, Lyons and Mediterranée—is confined to its own clearly delimited territory, with the exception of a certain interlacing of the Etat and Paris–Orléans lines between Brest, Tours and Bordeaux. Again, in Northern France the acceleration of express trains is still attended by serious difficulties, as the destruction of lines in the war areas was so absolute that miles and miles of temporary track are still in use, over which only the most moderate of speeds are permissible. For example, all fast trains on the St. Quentin section of the Nord Railway, over which were run before the war the fastest trains in Europe, have to slacken to 25 m.p.h. or so between Chauny and Montescourt—a distance of some 12 miles—which in itself involves a loss of as many minutes and more, as compared with the pre-war allowances. Yet it is remarkable to note that, of all the French lines, the Nord and Est—those exclusively affected by the last-mentioned difficulties—have effected by far the most rapid restoration, and now operate the fastest express train services in France.

The present article should be read in conjunction with the article on British Summer Train Services, which appeared in the October issue, and to which references will be made by way of comparison. French times quoted are taken from the *Indicateur Chaix*—that vast French "Bradshaw" which has a superficial measurement of 14½ in. by 10, and, not content with that, proceeds to make its

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appearance in a fresh edition every *week*, so that the number of published issues, in this its 67th year of publication, is well above 3,500. At the same time it contains many valuable features, some of which our English counterpart might do well to copy, and which help to make it unique in its way. The figures concerned relate to the maximum French summer service which was in force during the height of the 1922 holiday season. In this respect French practice differs somewhat from our own in that, instead of all the additional trains which make up the full summer service commencing to run on

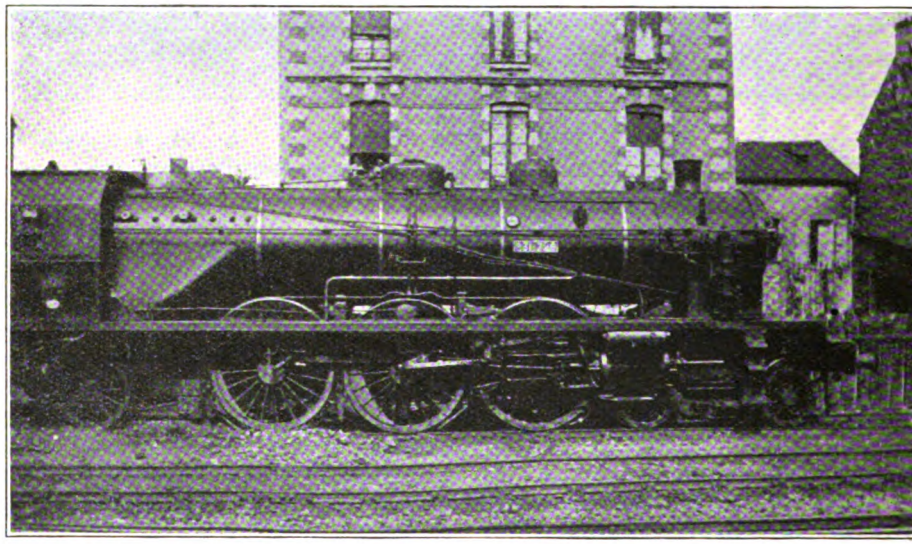

Photo.] C. DE FER D'ÉTAT. [*C. F. E. Harvey.*

Four-cylinder 4-6-2 compound locomotive, No. 231–728, at Laval.

one given date, and finishing on another, the extra trains are brought on by degrees, as required—with full preliminary notice, of course—so that haulage of half-filled surplus trains is avoided. Full summer service in France covers generally the months of July, August and September, but at the same time there are a number of seasonal trains, especially to and from the coast resorts, which run at week-ends only in July and September, and daily in August.

Considerations of space do not allow of the reproduction of a lengthy table, corresponding to Table "A" in the British article, showing how the war affected the principal French train services, and the extent to which they have revived subsequently. In long-distance times, over no matter what distance, Great Britain takes an undoubted lead as regards speed. If a zone of 100 miles be considered, there were between Paris and Arras, 119¾ miles, nine daily expresses averaging 2 hours 23 min. on their journeys, equals 50·3 m.p.h.; between Paris and Troyes, on the Est line—another very fast French service—there were 11 daily express trains over 103¾ miles in an average of 124 min., which represents 50·2 m.p.h. In comparison with this, the London–Birmingham services of the London and North Western and Great Western Railways offer jointly 30 daily "fliers" in an average time of 121½ min. for journeys of 113 and 110½ miles respectively, involving mean speeds of 55·1 and 54·4 m.p.h. Over the 99 miles between St. Pancras and Leicester, again, 28 expresses make daily journeys averaging in time 115 min., and in speed 51·7 m.p.h. In a zone of about 200 miles, 12 daily expresses on the Est between Paris and Nancy, 219¼ miles, occupied 5 hours 19 min.—average 41·2 m.p.h.—as against the 4 hours 8 min. of 30 London and North Western and Midland trains between London and Manchester—mean speeds 46·4

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and 45·2 m.p.h., over 188½ and 190 miles respectively—or the 4 hours 11 min. of 28 trains between London and Leeds by Midland and Great Northern Railways—mean speed 45·6 m.p.h. over an average distance of 191 miles.

Comparisons over longer distances afford the same results. Average distance from London to Carlisle is 304 miles, and the average summer journey time of 27 express trains by the London and North Western and Midland routes was 6 hours 33 min., which works out at 46·4 m.p.h.; average time over the 318¼ miles of the P.L.M. between Paris and Lyons, on the other hand, was 7 hours 54 min., equals 40·3 m.p.h. (14 trains, two of which were first class only), and between Paris and Basle by the Est, 326¼ miles, 8 hours 32 min. by 10 trains, at an average of 38·2 m.p.h. A 400-mile zone just fits the London–Edinburgh and London–Glasgow distances; as regards the former, 18 East and West Coast daily expresses worked over an average of 396½ miles at 44·8 m.p.h. in 8 hours 49 min. (mean), and as to the latter, 16 by the West Coast and Midland routes tackled an average journey of 413 miles in an average time of 9 hours 13 min., at 44·9 m.p.h. Compared with this, the Paris–Bordeaux service of the Paris–Orleans Railway, including two *trains de luxe* in each direction—the *Sud* express and the *Pyrenées-Côte d'Argent* "flier," both reserved to first-class passengers, and commanding also a heavy supplementary charge—consisted of 14 daily *rapides* only, taking 8 hours 50 min. and averaging 41·3 m.p.h. over their 365¼ miles' journey. Lastly, if a 500-mile zone be considered, we may compare the 532 miles average journey of 15 East and West Coast London–Aberdeen express trains daily with the famous Riviera service of the P.L.M. over the 535¾ miles between Paris and Marseilles; average times work out at 12 hours 41 min. in the former case, as compared with precisely one hour more in the latter, and average speeds in a proportion of 41·9 to 39·2 m.p.h. respectively.

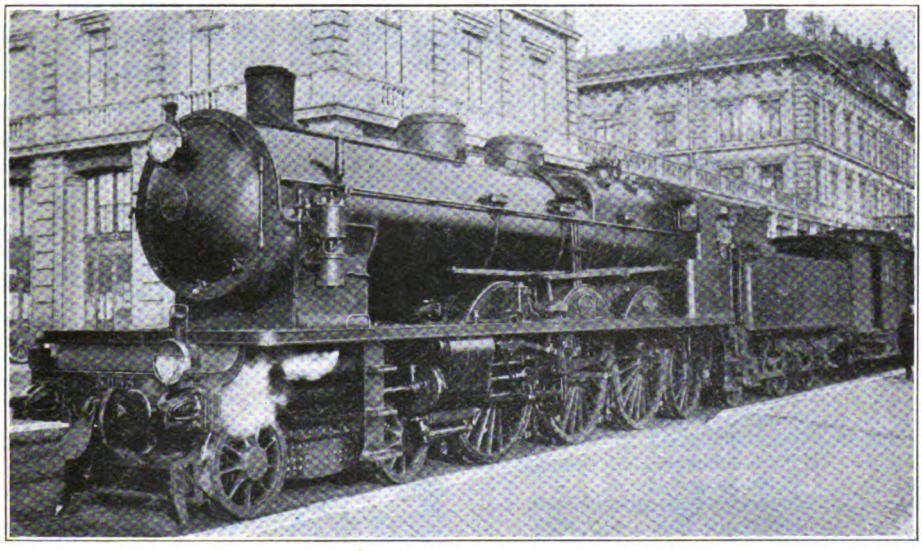

Photo.] C. DE FER DU NORD. [*W. H. C. Kelland.*

Four-cylinder compound 4-6-2 locomotive, No. 3.1153, at Calais (Maritime).

In explanation of these figures, it must be explained that the density of circulation of the population in this island is considerably higher than in any other country, not only in Europe, but probably in all the world, and this fact permits British railways to operate non-stop runs over long distances, passing *en route* towns and junctions of great importance, and still to obtain a reasonably good train-load of passengers throughout the journey. In

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Europe and America, on the other hand, the density of service being much less, on the average, than in England, the majority of express trains are compelled to halt at practically every intermediate point of importance, in order that adequate service may be given, and this fact adversely affects overall times. Apart from this consideration, track-troughs are not employed in France—with one exception, so far as I am aware, on the State line between Chartres and Saumur—and the question of water supply therefore comes in, together with that of locomotive working generally. The Laroche stop of all the P.L.M. express trains without exception between Paris and Dijon has no traffic importance, and is made almost exclusively for changing engines and examination of train, thereby splitting this journey of 195¾ miles into two almost equal halves. Similarly all the apparently non-stopping expresses on the Nord between Calais or Boulogne and Paris stop for 4 minutes at Abbeville in order to take water, and the non-stop duration of their journeys is thereby reduced to 109¾ miles, covered in most instances in just over the even two hours.

Table A details the longest non-stop runs performed daily during the summer on French railways. For reasons just mentioned, the first three are nominal only, the longest actual break being that of the Etat, at a very moderate speed, between Paris and Trouville-Deauville. Only the Nord, Est and Etat lines actually book 100-mile runs, which together total 52 daily—as compared with 111 on British railways last summer—but the P.L.M. Laroche–Dijon break, made by 37 trains, only falls short of the 100-mile limit by the small margin of ½-mile. The longest run on the Midi is one of 92 miles, and on the Paris–Orléans 86¼ miles. If runs be included down to 94 miles (roughly 150 km.), the British total during the summer was 146 daily, as against 137 in France, but of course the average length of the British journeys, which commence with the Great Western world's record of 225¾ miles between Paddington and Plymouth, is considerably greater. In point of numbers, the Est takes first place with 25 100-

TABLE A.—LONGEST FRENCH NON-STOP RUNS IN THE SUMMER OF 1922.

Railway.	Between.	Distance.	No. of runs.	Fastest run.		
				Time.	Direction.	Speed.
		miles.		min.		m.p.h.
Nord	Paris–Calais Maritime ..	184½‖	4	215	Down ..	51·4
,, ..	Boulogne (Tintilleries)–Paris	158½‖	1	183	Up ..	51·9
,, ..	Paris–Boulogne Ville	157½‖	3	180	Both ..	52·5
Etat	Paris–Trouville	136¾	5	193	Down ..	42·5
,, ...	Chartres–Saumur	123	4	167	,, ..	44·2
Nord	Paris–Arras	119¾	7*	128	Both ..	56·1
,, ..	Paris–Noyelles	117½	1	137	Down ..	51·5
Est	Chaumont–Belfort	112½	2	150	,, ..	45·0
Nord	Paris–Abbeville	109	1	120	,, ..	54·5
Est	Paris–Chalons	107½	12	125	,, ..	51·6
Etat	Dieppe–Paris¶	104½	3	168	Up ..	37·3
Est	Paris–Troyes	103¾	11	111	,, ..	56·1
P.L.M. ..	Laroche–Dijon	99½	37	127	,, ..	47·0
,, ..	Paris–Laroche†	97½	20	137	Down ..	42·7
Nord	Paris–Rheims	97	5	115	,, ..	50·6
P.L.M. ..	Paris–Laroche‡	96¼	14	130	,, ..	44·4
Nord	Paris–St. Quentin	95	9	107	Up ..	53·7
Midi	Bordeaux–Dax	92	4	112	Down ..	49·3
P.L.M. ..	Dijon–Bourg§	88¼	14	136	Up ..	38·9
Est	Paris–Epernay	88¼	3	110	,, ..	48·1
Orléans ..	Angoulême–Bordeaux ..	86¼	6	102	Down ..	50·7

‖ Include 4-min. stops at Abbeville for water. * 2 on Wednesdays and Saturdays only.
¶ Via Pontoise. † Via Héricy. ‡ Via Moret. §; Via St. Amour.

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mile runs daily, the Nord second with 15, and the Etat third with 12, if, however, the distance be lowered to 150 km., the P.L.M. is easily first with no less than 71, the Est coming second with 30, the Nord third with 24, and the Etat fourth with 12, neither the Midi nor the Paris-Orléans having any runs quite so long. In the matter of speed, as will be seen, there is little to choose between the fine achievements on the Est and Nord Companies respectively.

This brings us to the fastest runs performed upon each of the French railways, set out in Table B. Here again the Est and Nord Railways are in close competition for the top place, and both have many other runs only slightly inferior in point of speed, as witness the average speed of the non-stop runs cited in Table A. As regards short runs, too, such times as 34 min. for the 31¾ miles start-to-stop from Abbeville to Etaples on the Nord (equals 56 m.p.h.), are good examples of what is performed in the ordinary services of these lines. At the same time it may be recalled that six British lines—the North Eastern, Great Central, Great Western, London and North Western, Caledonian and South Eastern and Chatham—can all show start-to-stop schedules at higher speeds than the highest in France; the four first-named, indeed, schedule between them no less than 19 daily runs at speeds of 58 m.p.h. or over from starting-point to stopping. It is of interest, too, to note that the South Eastern and Chatham management can now offer a run booked at higher speed than anything on the Nord, in view of the reproaches which have been levelled in the past at the sloth of boat train timings on this side of the Channel as compared with those on the other. It is surprising to find the far-famed P.L.M. Company so low down in the table, with no scheduled run at as high a speed as 50 m.p.h. (the run shown is made by the daily *train de luxe* from Vichy to Paris); the Etat, on the other hand, has never made any pretensions to high-speed running, although its booked speeds now operating are much below pre-war figures.

When we come to the creature comforts of travel, we find the restaurant car in much more limited use in France than in this country. The total daily services operated on each line, in all cases by the International Sleeping Car Company, are as follows:—

TABLE B.—FASTEST RUNS ON FRENCH RAILWAYS IN THE SUMMER OF 1922.

Railway.	Train.	From—	To—	Distance.	Time.	Speed.
				miles.	min.	m.p.h.
Est	8.30 p.m.	Chaumont ..	Troyes	59·4	63	56·6
Nord	4 runs¶	Paris ..	Arras	119·7	128	56·1
Paris–Orléans ..	2 runs ..	Les Aubrais	S. Pierre-des-Corps	69·5	79	52·8
Midi	7.38 p.m.	Bordeaux ..	Agen	84·5	100	50·7
Alsace-Lorraine	5.05 a.m.	Strasbourg ..	Selestat	27·3	33	49·6
P.L.M.	12.33 p.m.	Pougues ..	Montargis	76·4	93	49·3
Etat	3.01 p.m.	Oissel ..	Paris	78·2	101	46·5

¶ In both directions; 2 on Wednesdays and Saturdays only.

Paris, Lyons & Mediterranée ..	36
Etat	31
Paris–Orléans	28
Nord	28
Est	24
Midi	11
Alsace-Lorraine	10

Allowing for cars which run over the lines of more than one company, such as those between Boulogne and Basle, the daily total is 158, which compares with the corresponding British figure of 556. It is the general practice to employ a composite car with about 36 seats for both first- and second-class passengers indiscriminately, and the only instance to my knowledge in which more than one car is employed is the midday boat service from Paris to Calais, which carries two cars in the formation, one for first- and one for second-class passengers. The use of the restaurant car is not so ingrained a habit with French travellers as it is here, partly because the

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cost of French meals is fairly high. Strangely enough, it varies also according to the relative importance of the train concerned. On the P.L.M. system, for example, a *déjeuner* or a *diner* on an ordinary express costs you 10 fr.; on the Riviera trains the figure is 12 fr., except as regards the Riviera *Rapides* that are first-class only (as well as those to Le Fayet and Vichy), in which case the cost mounts to 15 fr.; while when you reach the dignity of *trains de luxe* the rate is 20 fr. for *déjeuner* and 25 fr. for *diner*!

When we come to sleeping accommodation, however, the French figures are, in view of the length of the journeys, very far ahead of those in this country, while a variety of accommodation, of varying comfort, is offered at proportionately varying prices, the proper sleeping cars, or *wagons-lits*, being supplemented by *lits salons, lits toilettes, compartiments couchettes*, and so on. The procession of night expresses out of the various Paris terminal stations is remarkable, especially from the Gare de l'Est, the Quai d'Orsay of the Paris–Orléans line, and the Gare de Lyon. That from the last-mentioned station, indeed, is probably without parallel in any part of the world as regards trains operated by one single railway company, and I have therefore set it out in detail in Table C. Seventeen long-distance express trains leaving in three hours represents an average of one every 10 min., or just over; the average length of journey covered by each over the P.L.M. system alone (that is, apart from through subsequent working in other countries) is one of 435 miles—42 miles further than from London to Edinburgh by the East Coast route—and affords a problem in the supply of adequate locomotive power such as faces no British railway company. Most of these trains, too, are of weighty formation, being made up to 400 tons and more in many cases. The value of the traffic conveyed is also apparent when it becomes feasible to

TABLE C.—P.L.M. RAILWAY: NIGHT EXPRESS TRAINS FROM PARIS (GARE DE LYON)

Time.	Description.	Class.	Sleeping Accommodation	¶ Destination.	¶Approx. Distance.	First Stop.	Distance.
p.m.					miles.		miles.
7.25*	Rapide ..	1st only ..	S.C., L.S., C.C.	Le Fayet (Chamonix)	436	Laroche	96¼
7.32*	Luxe ..	,, ,, ..	S.C. (entirely)	Vallorbe [Constantinople.]	288	,, ..	96¼
7.50	Rapide ..	1st, 2nd, 3rd	— L.S., C.C.	Cette (Spanish Frontier).	540	,, ..	96¼
8.00	,, ..	1st only ..	S.C., L.S., C.C.	Vintimille (Riviera)	697	,, ..	96¼
8.10	,, ..	1st & 2nd	S.C., L.S., C.C.	Evian (Lake of Geneva).	404	,, ..	96¼
8·20	Express ..	1st, 2nd, 3rd	— L.S., C.C. ..	St. Etienne	312	Montargis	97¼
8.25	Rapide ..	1st only ..	— L.S. — ..	Marseilles	536	Laroche	96¼
8.35	,, ..	1st, 2nd, 3rd	— L.S. C.C. ..	Grenoble (French Alps).	393	,, ..	96¼
8.44	Express ..	,,	— C.C. ..	Nîmes (S. France) ..	450	Montargis	77¼
8.45	Rapide ..	,,	—	Vintimille (Riviera)	697	Laroche	97¼
9.00	Express ..	,,	S.C. — C.C. ..	Vallorbe. [Milan.]	288	,,	97¼
9.10	Rapide ..	1st & 2nd	S.C., L.S., C.C.	Bourg-St. Maurice (French Alps).	423	,,	97¼
9.30	,, ..	1st, 2nd, 3rd	S.C. L.S., C.C.	Geneva	389	,, ..	97¼
9.45	Express ..	,,	— L.S., C.C. ..	Belfort	313	Sens ..	71¼
10.00	Rapide ..	,,	S.C., L.S., C.C.	Modane. [Turin and Rome.]	431	Laroche ..	97¼
10.10	Express ..	,,	—	Marseilles	536	Montereau	50¼
10.25	,, ..	,,	— L.S., C.C. ..	Clermont-Ferrand and Vichy.	261	Montargis	77¼

* Restaurant car train. ¶ Destination and distance on P.L.M. system; ultimate destination in square brackets.
S.C.: Sleeping Car. L.S.: Lits Salon. C.C.: Compartiments Couchettes.

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dispatch four express trains carrying only first-class passengers over very long journeys within the course of a single hour. For the enlightenment of readers it may be added that the *train de luxe*, composed exclusively of first-class sleeping and dining cars, represents the highest form of travel in France; after this comes the *rapide*, generally confined to first-class, or first and second-class passengers only; then the *express*, conveying all classes, and fairly fast, and after that the *directe* (semi-fast on branch lines), the *omnibus*, or "all stations," and the *mixte*, corresponding to our mixed train.

In conclusion, it may not be without interest to detail one or two recent running experiences on the Nord system. Table D contains several carefully recorded logs between Paris, Boulogne and Calais, three timed by Mr. J. Macartney Robbins, and the fourth a journey of my own, while a

TABLE D.—C. DE F. DU NORD. PARIS–BOULOGNE–CALAIS.

2.652 4-4-2	3.1161 4-6-2	Distance.	Engine No.: Engine Type:	Distance.	3.1153 4-6-2	Distance.	3.1169 4-6-2
367	322		* Load (tons tare)		270		330
385	340		* Load (tons full)		285		350
m. s.	m. s.	miles.		miles.	m. s.	miles.	m. s.
0 00	0 00	0·0	Paris	109·0	121 15	109·0	121 10
							sigs.
6 50	6 05	3·8	St. Denis	105·2	115 55	105·2	114 47
9 25	8 35	6·3	Pierrefitte	102·7	113 25	102·7	112 22
21 45	20 30	16·5	Poste 21 (summit) ..	92·5	103 40	92·5	102· 30
24 15	23 02	18·5	Survilliers	90·5	101 20	90·5	100· 17
30 28	28 55	25·4	Chantilly	83·6	92 45	83·6	92 00
35 25	34 08	31·3	Creil (slack)	77·7	85 55	77·7	85 47
45 57	44 35	41·0	Clermont	68·0	76 50	68·0	—
56 22	55 55	49·4	St. Just	59·6	68 05	59·6	69 25
62 10	62 00	54·2	Gannes (summit) ..	54·8	63 10	54·8	64 50
72 10	71 25	64·7	La Faloise	44·3	51 45	44·3	53 43
p.w.c.							
82 25	78 07	72·5	Dommartin	36·5	42 50	36·5	45 20
89 00	84 20	78·4	Longueau	30·6	36 05	30·6	37 40
p.w.c.	p.w.c.				p.w.c.		p.w.c.
94 50	88 25	81·2	Amiens (slack)	27·8	31 10	27·8	32 30
	p.w.c.						
105 00	100 47	89·9	Picquigny	19·1	21 40	19·1	23 13
							½ p.w.c.
113 13	109 23	98·2	Longpré	10·8	13 35	10·8	13 02
118 35	115 00	103·6	Pont-Rémy	5·4	8 05	5·4	7 48
124 45	121 35	109·0	} Abbeville .. {	0·0	0 00	0·0	0 00
	0 00	0·0	} {	75·2	93 35	48·6	52 05
	11 33	8·4	Noyelles	66·8	84 30	40·2	42 41
	20 59	17·8	Quend-Ft. Mahon ..	57·4	75 10	30·8	33 41
	31 20	27·6	St. Josse	47·6	65 20	21·0	24 12
	35 43	31·6	Etaples	43·6	61 30	17·0	20 37
	46 08	39·8	Neufchâtel (summit) ..	35·4	52 0	8·8	12 43
	51 23	45·4	Pont de Briques (slack) ..	29·8	45 10 p.w.c	3·2	6 10
			Boulogne Ville			0·0	0 00
	55 45 sigs.	49·3	Boulogne (Tintilleries) ..	25·9	38 55	—	—
	67 25	58·2	Marquise	17·0	29 20	—	—
	76 43 sigs.	63·4	Caffiers (summit) ..	11·8	23 30	—	—
	87 25 sigs.	72·3	Fontinettes	2·9	7 10	—	—
	93 45	75·2	Calais Maritime ..	0·0	0 00	—	—

* English tons.

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description follows of some equally detailed timings between Paris and St. Quentin by M. Charles Chalut, a Paris reader. The engines concerned were the 4-4-2 4-cylinder de Glehn compounds, for many years the standard express type on this railway, and now superheated, and the numerous 4-6-2 compound superheaters, which perform the majority of the present-day main line haulage. Their respective dimensions are as follows :—

	"Atlantic" (4-4-2) Type.	"Pacific" (4-6-2) Type.
Cylinders—		
H.P. (2) ..	13½ in. by 25½ in.	16 in. by 26 in.
L.P. (2) ..	22in. by 25½ in.	23 in. by 26 in.
Driving wheels, diam. ..	6 ft. 8 in.	6 ft. 8 in.
Heating surface—		
Fire-box ..	170 sq. ft.	187 sq. ft.
Tubes ..	2,200 sq. ft.	2,106 sq. ft.
Superheater	410 sq. ft.	485 sq. ft.
Total ..	2,780 sq. ft.	2,778 sq. ft.
Grate area ..	29 sq. ft.	35 sq. ft.
Working pressure ..	227 lb. per sq. in.	227 lb. per sq. in.
Adhesion weight ..	32 tons 12 cwt.	48 tons 4 cwt.
Total weight (Working order) ..	66 tons 7 cwt.	84 tons 12 cwt.

The "Atlantic" thus corresponds roughly in weight to an English Great Northern 4-4-2, and the "Pacific" is from 5 to 7 tons heavier than the largest British 4-6-0 types, and some 8 tons lighter than Mr. Gresley's 4-6-2 on the Great Northern Railway. All the six large French railways now employ the "Pacific" wheel arrangement almost exclusively for their leading express passenger work, its popularity being due principally to the large fire-box rendered possible by the absence of coupled wheels at the cab end, which is valuable on account of the inferior quality of the fuel generally burned, and the increased adhesion weight afforded by the 4-6-2 as compared with the 4-4-2 wheel arrangement. It should be added that the high heating surface in the case of the Nord "Atlantics" is due to the use of Serve ribbed tubes, but the surface in this case is probably less efficient than the 95 sq. ft. smaller surface of the "Pacifics," which are not so equipped, although their boilers, of course, are much larger.

As regards gradients, the first 2½ miles out of Paris fall at 1 in 250, with a short strip at 1 in 84; then follows an ascent to "Poste 21" (a signal-cabin), from 4½ to 16½ miles, almost exclusively at 1 in 200, with an exactly corresponding descent from there on to 30 miles, just before Creil, where speed is generally reduced to about 45 m.p.h. From 30 miles to Gannes there ensues a still longer ascent, 24 miles in length, but less steep, the first 10 miles being at about 1 in 400–500 to near Clermont, the next length, to St. Just, ranging mostly round 1 in 250, and the remainder to the summit easing from 1 in 250 to 1 in 300. The descent from Gannes to Longueau is principally at 1 in 333, and there then follows a bad slowing through Amiens. From 85 miles the line is almost dead level for all the 55 miles to Etaples; then follows a sharp ascent to a point about ¾-mile on the Paris side of Neufchâtel, concluding with 2½ miles at 1 in 133, with a descent of 3½ miles at 1 in 143–133 towards Boulogne. At the Birfurcation d'Outreau at Boulogne trains for the Calais direction must reduce speed, and sharp undulations follow, with several 2-mile banks at 1 in 125 to a point a mile on the Paris side of Marquise, where there commences a toilsome climb of 6 miles at this inclination to Caffiers, followed by 7¼ miles down at 1 in 125 to Fontinettes; the latter makes a very bad start from Calais for east-bound trains. This is therefore by no means an easy road, although the Boulogne trains are considerably better off than those to and from Calais.

Table D gives ample details of the times observed, but a few notes may be added as to the speeds. Magnificent hill climbing has always been a feature of the work of the Nord compounds, and these figures bear it out. On the west-bound journeys, the "Atlantic" with a 385-ton train maintained an average of 49·6 m.p.h. right up the 1 in 200 from Pierrefitte to Poste 21, and the "Pacific," with 340 tons, an average of 51·4 m.p.h.—a striking comparison with the average speeds maintained by English Great Northern "Atlantics" similarly loaded over precisely similar ruling grades. Again, the French "Atlantic" kept up an average speed of 51·4 m.p.h. all the way from Creil up to Gannes—22·9 uphill miles—and the "Pacific" would doubtless have done equally well, and better, had she not clearly been "eased" after Clermont, in order to avoid getting too much ahead of time. Downhill speeds were, as always,

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strictly moderate, the highest being the 4-4-2's average of 71·7 m.p.h. from Chantilly to Creil, and the 4-6-2's 70·2 from Survilliers to Chantilly; the latter also maintained a mean speed of 68·2 m.p.h. from Gannes to Dommartin, a distance of 18·3 miles. The "Atlantic" recovered slowly from Amiens slack, but ran on the level at an even "60" from Picquigny to Pont-Rémy; the 4-6-2 had no need to hurry, and maintained a little less than the mile-a-minute rate. Net time of the 4-4-2 from Paris to Abbeville was 120¾ min., and of the 4-6-2 119½ min.; no allowance is made for the prolonged track slowing between Longueau and Amiens, which is practically permanent for a time and is presumably covered in the 122-min. schedule. After Abbeville the 4-6-2 made an energetic start to Etaples, averaged 47·2 m.p.h. from there up to Neufchâtel, and 33·5 up the 1 in 125 from Marquise to Caffiers; net time from Abbeville to Calais, allowing for the bad signal checks at Marquise and Fontinettes, was not more than the 89 min. allowed.

In the east-bound direction No. 3.1153 "Pacific" had a lighter load from Calais, with 220 min. allowed to Paris, or 216 min. actual running time, deducting the 4 min. stop scheduled at Abbeville. Up the 1 in 125 from Fontinettes to Caffiers an average speed of 32·7 m.p.h. was maintained, and from there to Abbeville things were taken quite easily. From Abbeville, however, a smart start was made to Amiens; thence to Gannes the throughout uphill average was 53·6 m.p.h., and from Creil up the 1 in 200 to Poste 21 exactly 50 m.p.h. Downhill speeds were but little above the mile-a-minute rate, and even so the running time from Calais to Paris was 214 min. 50 sec., or about 212 min. or a shade less if allowance be made for the p.w. slowing at Boulogne. Considerably finer work was done by No. 3.1169 on the Boulogne train; the time of 52 min. 5 sec. for the 48·6 miles from Boulogne over Neufchâtel summit to Abbeville was brilliant, and then the Abbeville–Paris run was made in a net time of 118 min., with no allowance for the Amiens–Longueau slackening. Average speed from Dommartin up to Gannes was as high as 56·3 m.p.h., and, still finer, the 1 in 200 from Creil up to Poste 21 was run at an average of 53·2 m.p.h. Such figures, although a little inferior to pre-war performance on the Nord, are well in advance of average upgrade running in this country.

The St. Quentin run was made by the best pre-war express in 93 min.—for 95·1

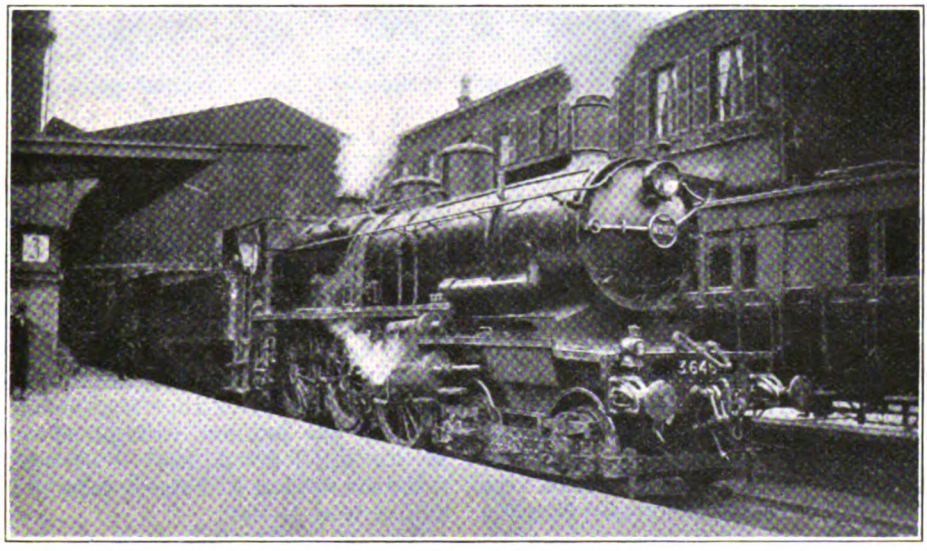

Photo.] C. DE FER DU NORD. [*C. F. E. Harvey.*

Four-cylinder compound 4-6-0 locomotive, No. 3.645, at the Gare du Nord, Paris.

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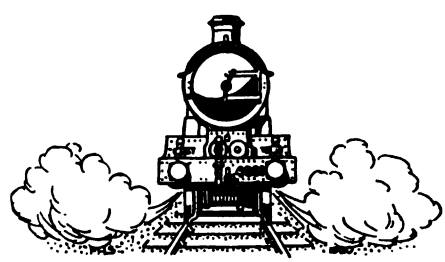
miles, start-to-stop—but the fastest present time in this direction is one of 110 min. The trains are, however, considerably heavier than in pre-war times, most of the Brussels and Cologne expresses running combined to Aulnoye, and there are also the war zone hindrances previously mentioned. The Calais route is followed as far as Creil, after which the line is practically level for 50 miles, when there intervenes a rise of 1 in 330 for some 10 miles to a point 5 miles short of St. Quentin. On the 12.30 p.m. out of Paris, "Pacific" No. 3.1159 had an 11-coach load weighing 335 tons empty and 350 tons with passengers and luggage. St. Denis was passed in 6¼ min., Pierrefitte in 8 min. 50 sec., Survilliers in 23 min. 18 sec., Chantilly in 29 min. 35 sec., and Creil, at 45 m.p.h., in 35 min. 5 sec.; the whole of the ascent to Poste 21 was negotiated at an average speed of 51·7 m.p.h. On the subsequent level stretch Chevrières, 42·7 miles, was passed in 47 min. 50 sec., after which came a p.w.r. check costing about 1¼ min. Compiègne, 51·9 miles, was passed in 57 min. 55 sec., and the ensuing 8·2 miles to Ribecourt were run in 8 min. 2 sec., after which came another p.w.r. check, at Ourscamp, costing a further min. Then, after getting through Noyon, 66·5 miles, in 73 min. 18 sec., the "Pacific" ran the 8 miles on to Abbecourt in 7¾ min., and passed Chauny, 76·6 miles, in 83 min. 10 sec., or 81 min. net. After this came very serious delays over war-damaged line, the next 10·9 miles to Montescourt taking no less than 21 min. 28 sec., so that the total time to St. Quentin was 113 min. 47 sec. It is difficult to assess an accurate net time for the whole journey, but if the line were in normal order, the running on this occasion, without delays, should have sufficed to complete the 95·1 miles from Paris to St. Quentin in about 101 min.

On the return journey an "Atlantic" appeared slightly overloaded with a train of twelve coaches, weighing in all 355 tons empty, and 375–380 tons with passengers and luggage; No. 2.658, dated 1907, was the engine. The usual commencing delays were experienced, so that it took 32 min. 27 sec. to pass Abbecourt, 20·6 miles, and 41½ min. to Noyon, 28·5 miles, but the 35·4 miles on to Creil were negotiated in 35 min. 17 sec., principal passing times being: Ribecourt, 35 miles, 47 min. 58 sec.; Compiègne, 43·2 miles, 56 min. 12 sec.; Pont St. Maxence, 56·6 miles, 69 min. 35 sec.; and Creil, 63·9 miles, 76 min. 47 sec. Signals were on badly at Orry-la-Ville, and spoiled the ascent to Survilliers, which was passed in 93 min. 42 sec. (76·7 miles); St. Denis, 91·3 miles, was passed in 108 min. 25 sec., but further signal delays outside Paris made the total time 115 min. 25 sec., instead of the 107 min. allowed. Net time was about 112 min. for the journey, with no allowance for its initial difficulties. Such runs as these are typical of French express locomotive work to-day.



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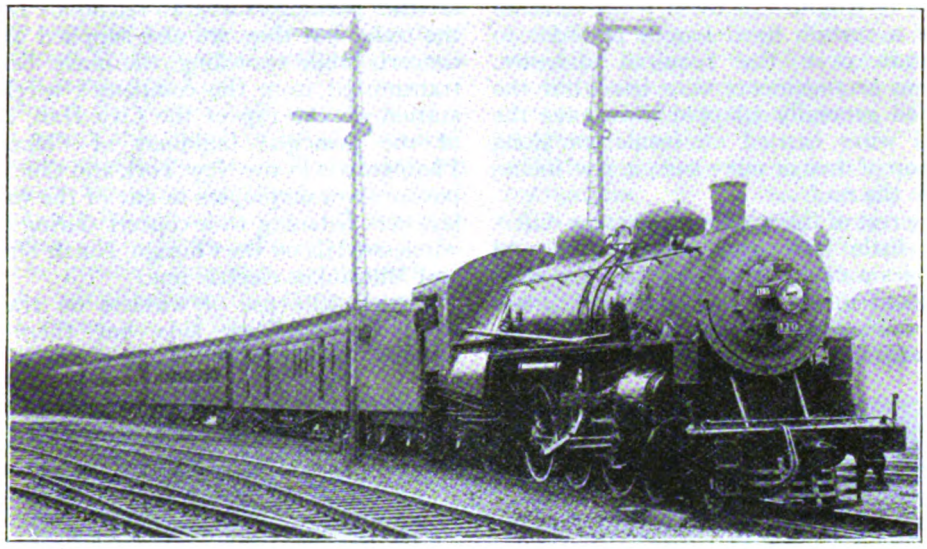

[By courtesy of the Marconi Wireless Telegraph Co. Ltd.

DELAWARE, LACKAWANNA AND WESTERN RAILWAY TRAIN FITTED WITH WIRELESS APPARATUS.

Wireless Telephony on Trains.

By GERALD H. DALY, late Lieut., R.A.F.

IS wireless telephony of practical value to railways? Evidently the railway companies of the U.S.A. think so, for many of them have fitted some of their finest trains with a wireless installation.

As far back as November, 1913, the Lackawanna Railroad Company fitted their "Lackawanna Limited" with wireless, and this appears to be the first occasion on which the new invention was applied to railways. Since that date the Union Pacific and many other United States railroad companies, following in the steps of the Lackawanna, have found that the results have fully justified the experiment, both from an advertising and utilitarian point of view.

On the Continent also trials have been carried out with train wireless, and passengers travelling on the well-known Berlin-Hamburg express are able to speak to any of their friends who happen to be on the ordinary telephone. But in this country we hasten slowly, as the saying is, and although some of the larger companies have given train wireless a trial, with one or two exceptions the idea has been shelved, and the only way in which the British companies have anything to do with wireless is through the medium of their cross-channel steamers.

Broadly speaking, the arrangement which has been adopted for railway wireless abroad is as follows. Permission to use wireless having been obtained from the Government, a suitable place for a land wireless station has been fixed. Usually this is located in one of the principal railway stations which is as near as possible central for the whole railroad system. The Union Pacific Company, mentioned above, have their chief wireless station at Omaha and have also established stations in many towns on their line. The apparatus used is the same as is found in any government or private wireless land station.

The construction of this central wireless land station, as it is called, offered very little difficulty, but the train set was a different matter.

In the first place the aerial wires which radiate and receive the signals, gave con-

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siderable trouble, for these wires have to be of a certain fixed length in order to transmit over the required distance. Various arrangements were tried, but the method generally adopted is to have the aerial wires carried on insulators along the top of two or more cars, a few inches above the roof.

The rest of the wireless apparatus differs very little from the ordinary set and occupies a cabin about the size of a compartment in one of our corridor trains—this, of course, includes ample room for the operator. The power for operating the installation is derived from a dynamo which is driven by the axles as they revolve in the same way as a lighting dynamo.

When a passenger wishes to speak by telephone, the train operator calls up the central wireless station and asks to be put through to the required number via the ordinary wire telephone. The operator at the central station on obtaining this number connects up the wire with the wireless telephone by merely putting in a plug and switch. The passenger can then speak as easily as he can when using the land telephone in the usual way.

Perhaps the most complete equipment of wireless telephony on trains is that of the Chicago Elevated Railroad. Not only are the passengers able to telephone from the train, but they are also supplied with concerts while travelling, the music being transmitted from the company's wireless station on the top of the City Hall, one of the principal buildings of Chicago. Photographs in the New York and Chicago papers show employees in one of the wireless cars listening to a concert during the wireless trials on the Chicago, North Shore and Milwaukee electric line.

That is the use of wireless on trains from the publicity side, but there is another way in which wireless might be of practical value to railway companies, and that is in foggy weather.

There is no need to dwell upon the waste of time and money, to say nothing of the danger which fog and blizzards cause to the railways of this island, and although the fog signalling system is very highly organised indeed, the time is eagerly awaited when its presence can be ignored. Yet if every train carried a wireless telephone installation and an efficient system of wireless communication could be established with moving trains, there would be no need for the engine driver during foggy weather to listen anxiously for the explosion of the detonator, or to waste time in slowing down and peering out of his cab

[*By courtesy of the Marconi Wireless Telegraph Co. Ltd.*

WIRELESS OFFICE AT BINGHAMPTON, DELAWARE, LACKAWANNA AND WESTERN RAILWAY.

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to look for the signal, nor would there be any need for the fog signalman to stand for hours in the damp fog with his red and green lamps and flags.

But many people will argue that it is not practicable to install every train with wireless telephony in a railway-congested country like Great Britain, that the drawbacks are far too numerous both from the railway and wireless point of view.

The greatest drawback to the railway is the initial expense in buying the necessary apparatus. While this is admittedly large, it is extremely probable that the sum required would compare favourably with the bill which the British companies pay for fog at the end of a "foggy" year, more especially if there happen to have been any costly accidents due to fog.

The type of wireless telephone set required for railway working would have to be of small power and dimensions. Many sets admirably suited to this purpose are in daily use both in this country and the U.S.A.

A good example of the capabilities of the small telephone set is the type which was used on aircraft during the war with ranges up to a hundred miles. A set of similar construction could easily be carried aboard the train and fixed up in a few minutes, yet the range or power of this aircraft set is far greater than that which would be required for the railways. It would, of course, be necessary to equip a certain number of signal boxes with the wireless telephone.

With regard to the operating of the installations; in the case of the trains this could be comfortably done by the guard who would have to be in some sort of communication with the driver. If, for instance, the guard received the order from the signalman to stop he could cause a red light in the engine cab to glow, or *vice versa*, with a green light. It might be claimed that owing to the roar of the train the guard might be unable to hear the signalman's voice, but it must be remembered that the aircraft telephone operators receive as efficiently through the terrific roar of the aero engine as their contemporaries in the silence cabinet down below. This is because it is a simple matter to increase the sound of the received voice to an enormous extent. Nor would it be necessary for the guard to sit by the instruments all the time or neglect his other duties.

In the case of the signal box set, after a few hours' tuition, the signalman would experience as little difficulty in using the

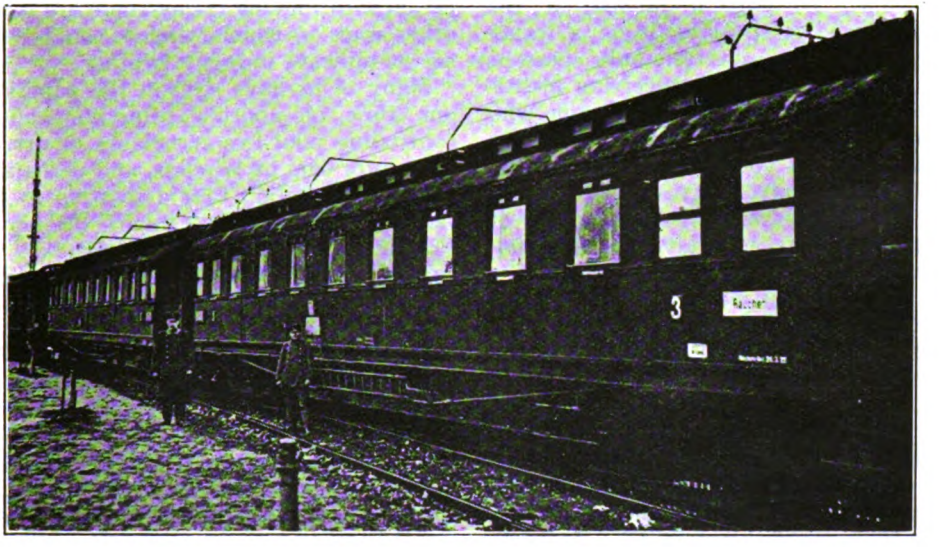

Photo.] [*General Photographic Agency.*

WIRELESS TELEPHONY ON BERLIN-HAMBURG EXPRESS.

Note aerials on roof of coaches.

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wireless telephone as he does with the ordinary phone.

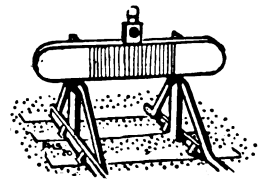
What are the wireless drawbacks? In the first place there is interference. For instance, when an operator speaks by the wireless telephone his voice can be heard by any station which happens to be within range, that is to say, if a sending station has a range of 50 miles anyone within that distance of the station can hear the operator speaking, but this only happens under certain conditions. These conditions are such that the person receiving the signals must be on the same wave-length as the operator who is sending them out. To explain further, if the operator who is speaking is on a wave-length of 1,000 metres, only persons who have adjusted their receiving instruments to 1,000 will hear him, anyone who happens to be above or below 1,000 metres will not hear his voice at all, and it is the use of these wave-lengths which has a great deal to do with the prevention of interference in present-day wireless communication.

But it has been mentioned before that the wireless telephone sets for railway working would have to be of very small power with a sending range of say three to five miles. Therefore, only when the train was within that distance of the signal box could the guard and signalman converse. So that by using very small power the railway wireless system would not suffer from interference at all. At large stations where many trains are dealt with interference would naturally tend to be greatest. This could be overcome by using different wave-lengths for different trains—up trains would be controlled on wave-lengths of 100 metres and down trains on 300 metres. Possibly a simple system of duplex wireless telephony could be introduced. This means that several operators sitting at the same table can send or receive at the same time without interfering with each other at all.

As many people know, the medium surrounding the earth is highly charged with electricity which sometimes makes itself manifest in the wireless receiver; these manifestations are called atmospheric disturbances and sometimes interfere with communication. But the blizzard and fog season in this country occur at a period when atmospheric disturbances are practically nil and in fact can hardly be designated as drawbacks at all.

Although wireless telephony is by far the most practical solution for communication with moving trains, there are many other ways in which wireless could be of use to railways in foggy weather.

Many of us have seen in the papers at one time or another something about controlling pilot-less aeroplanes or driverless motor cars by wireless, and perhaps it is in this direction that a solution to the railway fog difficulty might be found. Practically any firm which undertakes the construction of wireless control instruments could turn out an apparatus whereby the signalman from the signal box could control a miniature semaphore or cause a red or green light to burn in the engine cab of a train travelling past at 60 m.p.h. It is, however, beyond the scope of this article to enter into the intricacies, difficulties and drawbacks of wireless control. But it can be pointed out that wireless is proving of great value in overcoming the fog trouble in other methods of transport such as the aeroplane or steamship. And although conditions are hardly the same, it is quite possible that wireless properly applied may save the shareholder a great deal of money and prevent the general dislocation of the service which a bad fog frequently causes to the railways of this country.



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RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions and weights of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. No reader should send more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, the pages of the "Railway Year Book," should be consulted. The twenty-fifth Annual Edition of this standard railway reference work is on sale at 5s. net, or by post from the* RAILWAY MAGAZINE *Offices, 33, Tothill Street, Westminster, London, S.W.1, to any part of the world, 5s. 9d.*

Vacuum Pump v. Ejector.

In further reply Mr. A. M. Bushell writes: In the *Engineer* of February 1, 1878, you will find a paper by Mr. R. D. Sanders entitled "On continuous Brakes for Railway Trains." Mr. Sanders illustrated the article with diagrams of the various brakes then in use, and his system is shown with a pump on the axle of the engine, also steam brake cylinders are shown on engine and tender. From this it appears Mr. R. D. Sanders was the originator of using a pump to maintain the vacuum, as his brake was extensively used on the Great Western. Mr. Joseph Armstrong appears to have modified the valves of the pump, as he patented in 1883 improvements in valves of the vacuum pump. Mr. Armstrong also modified the brake, and it may not be known to some readers, that although it is being replaced by the standard cylinder of the Vacuum Brake Company, there are several vehicles still fitted with the peculiar arrangement of having a fixed piston, the piston rod being hollowed out, and the cylinder moving up and down thereon. To readers who desire to see this arrangement I refer them to the *Railway Engineer* of 1884.

[Further reply to C. L. PARSONS.]

Unusual Rolling-Stock Combinations.

Your remarks as to the composition of a train leaving York for the south hauled by a Great Central Railway 4-4-0 engine and consisting of two Great Central Railway non-corridor bogies; three North Eastern Railway bogies, one a dining-car, York to Swindon; one Great Western Railway bogie, York to Penzance; two North British Railway bogies, one Aberdeen to Penzance and one Glasgow to Penzance; and one North British Railway horsebox, are certainly of interest. We may mention, however, that the particular point of the paragraphs in our September number was that the unusual train compositions were not of a standard character. There must be many trains conveying several through coaches which would introduce interesting combinations of the kind noted by you, especially where the service is divided on alternate days between the companies concerned in joint and through services.

[Reply to R. R. BAKER.]

Piloting on the Great Northern Railway.

Although piloting is by no means usual on this line, exceptionally heavy trains are sometimes assisted by a 0–6–2 tank engine between King's Cross and Potters Bar. Seeing that these locomotives occasionally run at 50 m.p.h. or even greater speeds when working fast suburban trains, there could be no possible danger in their use for assisting express trains on the heavily graded section noted. The new "Pacifics" are designed to meet increasing requirements. Except for test runs, however, such as that noted in the November

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number, the work upon which the 4–6–2 locomotives are employed can at present usually be dealt with by the ordinary "Atlantics," though possibly with somewhat less efficiency when the latter are heavily loaded.

[Reply to A. SHIRLEY.]

London-Liverpool Services.

We do not quite see the point of your query as to the time spent at Rugby in combining the through coaches from Brighton, Eastbourne and Ramsgate to Liverpool with the London portion. Presumably the London train would not wait beyond a certain time if the connecting vehicles were late, but it does not follow that a second portion was run merely from this cause. It may have been more convenient to run a second train owing to the heaviness of the combined load or to the fact that an engine was available requiring to return to Liverpool. It may also be that the second part was enabled to gain on the first portion in the case you mention, owing to the relatively easy time allowed north of Crewe.

[Reply to F. HEWITT.]

Charing Cross as a Continental Traffic Terminus.

Commenting upon the reply already given, Mr. C. Kenneth Sandberg suggests that when the three principal Southern railways are combined in the same group, the two stations at Victoria should be set apart for Kent and Sussex Coast traffic, and that it may then become desirable once more to make Charing Cross the principal centre for Continental traffic, while the principal suburban services of the South Eastern section should be concentrated at Cannon Street and London Bridge, the latter operating in conjunction with the Brighton terminus alongside. He considers also that it may be found desirable to bring some of the principal Brighton business express trains into Cannon Street.

[Further reply to C. THOMPSON.]

Banbury and Cheltenham Railway.

Mr. T. R. Perkins, of Henley-in-Arden, mentions that this certainly was an independent line, though now amalgamated with the Great Western Railway, as he remembers it having separate time-tables, but ever since he has known the line (from 1896) the Great Western Railway has worked it. The small engine named *Hook Norton* was illustrated on page 398 of Vol. XXII of the RAILWAY MAGAZINE. It used to work the boat train to Weymouth Pier. "Its name" suggests Mr. T. R. Perkins, "seems to imply that it once worked on the Banbury and Cheltenham Railway, and it is possible that at one time the local company worked the line themselves."

[Reply to H. M. PEARSON.]

Southampton by Great Western Railway.

Presumably, the through carriage for Southampton, attached to the 5.55 p.m. from Paddington, is provided for the convenience of passengers from London to stations on the Didcot, Newbury and Southampton line, avoiding the need for changing at Newbury. In this case, as in many others, the convenience of passengers to intermediate stations is considered, and not that of passengers making the throughout journey. The fact that, as suggested by you, the coach returns on the 11.22 a.m. from Southampton to Newbury, being then transferred to the train due in Paddington at 2.50 p.m., no through working being, however, advertised, indicates that it has no special value for through traffic.

[Reply to L. HICKS.]

Weymouth Harbour Lines.

We are informed that in 1898 the Great Western Railway Company deposited a Bill in Parliament for a scheme for the Weymouth Harbour lines. This railway was to leave the main line near Upwey Junction and eventually reach the coast on the Weymouth side of Sandsfoot Castle. The Company proposed making the harbour for the Channel Islands boats adjoining the Admiralty Breakwater. Some part of the work was carried out, but it was afterwards abandoned. The land has already been sold, and apparently the Great Western boundary posts have not been removed. The new line was to pass underneath the Portland line close to Sandsfoot Castle.

[Reply to J. MATHER.]

Right *v.* Left-hand Running.

There is a considerable difference of opinion on the Continent as to whether

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trains should pass each other on the right- or on the left hand, and there are differences of method in the various countries, Belgium, for example, conforming to the British method of running on the left-hand rail, and Germany, on the other hand, running the trains mainly on the right-hand rail. For any country in which the practice is now settled, it would be an exceedingly expensive matter to change over, as all the connections would be wrongly arranged, and the vast majority of the signals would be in unsuitable and badly-sighted positions.

[Reply to "EX-BELGIQUE."]

Trans-Australian Railway.

Going east from Perth, Western Australia, it is necessary to change trains at Kalgoorlie, Port Augusta, Terowie, Adelaide, Melbourne, Albury, Sydney, and Wallangarra, in order to make the through journey to Brisbane. The service is, in fact, provided by utilising trains which run regularly over parts of the route, so that it is necessary to change trains for this reason as well as in consequence of break of gauge where that occurs. We should imagine that the numbers of passengers requiring to make the complete journey on any particular date are very small.

[Reply to E. V. FOX.]

Belgian Signalling.

Horizontal white boards, about 8 ft. long, fixed five in succession about 100 metres apart, on the Belgian State Railways, at the side of the track, are designed to indicate to drivers that they are approaching a distant signal. They bear, in succession, five, four, three, two and one diagonal black stripes, and zero is represented by the signal itself. The method may appear somewhat primitive, but in the country concerned, which is peculiarly liable to fogs, these indication boards are of great assistance to drivers in helping them to locate the signals in thick weather.

[Reply to "EX-BELGIQUE" and J. H. J.]

Summer Train Services.

In connection with the restaurant car table, "Voyageur" is careful to point out that the "foreign" workings relate only to the staffing of the cars. We believe that the Great Southern and Western through cars from Kingstown to Cork are at least manned in the forward direction from the start at Kingstown, even though on the return the staff may sometimes leave the cars at Kingsbridge. It is impossible to publish an article of the character you desire, owing to the difficulty of gathering reliable information on the matter.

[Reply to J. A. DANE.]

Somerset and Dorset Joint Railway Locomotives.

"S.J.C." mentions that the 0-4-4 tank engine mentioned was acquired from the Midland Railway in 1921 to replace an engine of the same type and number (54) which has been "scrapped." The engine now employed was originally No. 1305, when running on the Midland Railway, and was built at Derby in 1884 and rebuilt in 1902 and 1918. 0-6-0 goods engines Nos. 72 and 76 also retained their red livery when taken over from the Midland Railway about 1903.

[Further reply to "SOMERSET."]

Locomotive Breakdowns.

We are interested to read particulars of a breakdown between Wolverhampton and Wellington on the Great Western Railway, apparently due to a brake failure. It would appear, as you suggest, that the trouble was in the packing of the vacuum pump, hence the use of "string" in an attempt to patch up things sufficiently to continue the journey. We believe the vacuum pump is, on Great Western Railway locomotives, worked off one of the crossheads.

[Reply to C. E. T. J.]

"100 Miles an Hour."

We fear the newspaper "record" to which you refer is like many others of the same kind—without any foundation in fact. Speed observation on the part of those without expert training invariably is productive of wild exaggerations.

[Reply to "HAMPSHIRE."]

Great Northern Railway 4-6-2 Locomotives.

We have already explained that Nos. 1470 and 1471 are frequently to be seen on the 10.0 a.m. and 5.40 p.m. *ex*-King's Cross and the corresponding return trains.

[Reply to R.D.B.]

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Powerful Locomotives on Light Trains.

This question has been frequently dealt with. In many cases main line engines so employed are performing an odd duty between express journeys, or in order to obtain a return working they are so utilised. It does not follow that because a small engine is working a heavy load or a powerful engine a light train that that is the work upon which they are regularly employed. In many cases the other work performed by them is entirely in accordance with their capabilities.

[Reply to "QUERIST."]

Carstairs, Caledonian Railway.

The old direct route from the main line to Edinburgh direction, of which the embankment (partly used as sidings) may still be seen on the Carlisle side of Carstairs, was abandoned in order to bring the junction (now located at Strawfrank) nearer in to the station. This slightly increases the journey time, but as the number of trains travelling direct round the spur is very small, the loss is inappreciable.

[Reply to A. A. TORRANCE.]

Great Western Railway and Grouping.

The various railway companies are to be grouped as such, and, unless in the future any adjustments may be made between them, there is no suggestion of dividing up the present systems in any way. The Great Western Birmingham line will therefore, continue to belong to the Great Western Railway, and similarly in the case of lines belonging to companies going into other groups.

[Reply to R. W. HANBRIDGE.]

Locomotive Inspectors.

A locomotive inspector fulfils important functions. Chief among these is that of watching the working of the engines on behalf of the Mechanical or Operating Department of the railway concerned, many questions as to mechanical details, fuel consumption, observance of times, &c., arising constantly and needing immediate investigation or observation in this way. [Reply to E. RAVENSCROFT.]

Third Class Carriages.

There is something in your suggestion that it is unnecessary to label third-class compartments and that the expense of lettering the doors, inside and outside, might be saved. We doubt, however, whether it is altogether practicable. The question arises also whether such indication is not obligatory to some extent, though there are instances where carriages bear no class indication whatever.

[Reply to A. POWELL.]

Water Troughs.

Occasionally engines which ordinarily pick up water while travelling have to stop specially for water supplies, owing to the troughs being frozen over. As a rule, however, in frosty weather, the troughs are used sufficiently frequently for the scoops to be able to break up a thin film of ice before it becomes dangerously thick. Fortunately, such conditions are not of frequent occurrence in Great Britain.

[Reply to P. E. BROWN.]

Great Eastern Railway Locomotives.

You are correct in assuming that the 700 and 1020 rebuilt 4-4-0 classes were originally 2-4-0's having the same numbers. The device you have noted close to the chimneys of modern locomotives is the snifting valve, partly for admitting air to the cylinders when running with steam cut off, and partly as a relief valve in connection with the superheater when fitted.

[Reply to R. E. MOODY.]

Foreign Railway Gauges.

Speaking generally, the standard gauge abroad is 4 ft. 8½ in., though in South Africa it is usually 3 ft. 6 in., and in India and South America the 5 ft. 6 in. and metre gauges are principally employed. Particulars of gauge are given in the foreign section of the *Railway Year Book* wherever it is other than 4 ft. 8½ in. The latter is the standard gauge throughout North America.

[Reply to S. LEMEL.]

Cab Signalling on the Great Western Railway.

This is a system for warning drivers as to whether signals are clear or against them, and designed to cause an application of the brake should they pass a signal at "danger." A number of other types of apparatus are under trial on various rail-

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ways. The Great Western apparatus is used to a considerable extent on that railway.

[Reply to F. L. H. F.]

Devon and North Cornwall Light Railway.

Please refer to a large scale district map for information of the kind you solicit. We may, however, point out that Sheepwash appears to be within a mile or two of either Black Torrington or Hatherleigh stations. With regard to the location of Huish and Meeth, please consult a map of the district.

[Reply to "GLASTONBURY ABBEY" and M. H. BINSTEAD.]

Repeating Signals, Great Northern Railway.

Short home signal arms, painted yellow and lettered "R" on this railway, are repeaters indicating the position of the immediately following home signals, and working simultaneously with the latter. We have noticed the second matter to which your refer, but believe that there is no significance attaching to it.

[Reply to E. S. BARHAM.]

London and North Western Railway Compound Locomotive "Adriatic."

There are many legends as to exceptional speed performances of engines of the past, but we have never come across anything to suggest that this particular locomotive, a "Webb" three-cylinder compound of the "Teutonic" class, ever attained a speed of 110 m.p.h. or anything remotely approaching that figure.

[Reply to J. C. L. PARSONS.]

London and North Western Railway Locomotives.

Except that we believe a heavy class of main line tank engine is contemplated, we have no knowledge as to the class to which references have been made in the general press. They may be merely additional engines of the present ordinary standard classes, but we understand that they are of the 0-6-2 goods tank class.

[Reply to H. S. HACK.]

Gradient Profile, Caledonian Railway.

Gradient profiles of the Caledonian Railway were published in the April, May, June and July, 1904, numbers of the RAILWAY MAGAZINE. Occasionally, gradient profiles are included in Mr. Cecil J. Allen's articles.

[Reply to "N.W."]

Newcastle-on-Tyne and Holyhead.

We know of no regular through coach service, in connection with the Irish steamers, having been run between Newcastle and Holyhead, although we believe through coaches were for a short period in operation between Newcastle and Heysham, for Belfast, *via* Harrogate and Skipton.

[Reply to J. R. HETHERINGTON.]

The Fastest British Trains.

Full details of the fastest British services are given in "Voyageur's" article entitled "British Express Trains in the Summer of 1922" in the October issue. For the highest maximum speeds attained in ordinary service, consult Mr. Cecil J. Allen's monthly articles on locomotive performance.

[Reply to WATSON GREENFIELD.]

Standard Head Codes.

Although the standard lamp head codes are used by many leading railways, there are instances, even on lines which ordinarily do not use special codes, where for local purposes modifications are made, or special indications are employed. Presumably, such instances have been noted by you.

[Reply to "ASHPAN."]

Railway Station Architecture.

Waterloo and St. Pancras probably rank now as the most interesting stations architecturally in Great Britain. Abroad there are many very fine stations in this respect, the honours belonging now to the Pennsylvania terminal in New York.

[Reply to T. W. LINSELL.]

War Use of Railways.

IT is generally considered that railways were first definitely used for war purposes in the American Civil War of 1866, though ever since railways have been available they have figured more or less prominently in countries where war conditions have existed.

[Reply to T. W. LINSELL.]

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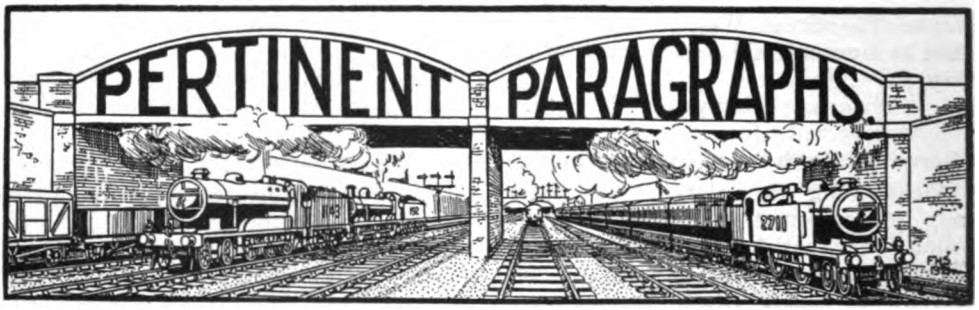

The London & North Eastern Railway.

FINANCIAL arrangements affecting the constituent companies of the North Eastern, Eastern and East Scottish group were announced some time ago. It is now stated that the directorate of the " London & North Eastern Railway " Company will consist of the following gentlemen :—(1) *North Eastern Railway* : Lord Joicey, Sir Hugh Bell, Viscount Grey of Fallodon, Mr. J. H. B. Noble, Sir Arthur Pease, Mr. Oswald Sanderson, Colonel Charles W. Trotter, Mr. M. J. Wilson, Mr. W. K. Whigham ; (2) *Great Central Railway* : Lord Faringdon, Mr. W. B. Gair, Mr. E. A. Beazley, Hon. Eric B. Butler-Henderson ; (3) *Great Eastern Railway* : Lord Ailwyn, Colonel Wm. Johnson Galloway, Sir Eric Hambro, Mr. Hubert T. Bailey ; (4) *Great Northern Railway* : Mr. F. L. Steel, Hon. Rupert E. Beckett, Mr. Bernard A. Firth, Mr. Oliver R. H. Bury ; (5) *North British Railway* : Mr. Alexander R. Gray, Mr. Andrew K. M'Cosh, Lieut.-Colonel the Hon. A. C. Murray, Mr. William Whitelaw ; (6) *Great North of Scotland Railway* : Mr. Alexander Duffus, Mr. William Whitelaw, Chairman of the North British Railway Company, has accepted the unanimous invitation of all the directors to become chairman of the new company on completion of the amalgamation.

Most of our readers will regret the passing of the familiar and historic names. The title selected conveys, however, the suggestion that the railway services radiate from London generally in a north-eastern direction or towards the north-eastern counties, though we should have preferred the retention of one of the " Great " titles, " Great Northern " or " Great Eastern," either of which would have been quite suitable. The new company is expected to " function " as from January 1, 1923, but many details have yet to be settled, including the incorporation of the subsidiary companies to be taken over. The new title emphasises that, although the North Eastern may be a predominant party, by virtue of its magnitude, the system will now extend to London as one entity, while the word " North " appears in the titles of four of the constituent companies and " East " in that of two, so that it goes far to satisfy any who may argue that at least a " flavour " of the old names should be retained, in which connection only the Great Central is left out, now that the Hull & Barnsley is already absorbed into the North Eastern.

The London, Midland & Northern Railway.

WE have received from the Secretaries of the London & North Western and the Midland Railway Companies a circular, dated October 25, 1922, stating that :— " We are instructed by the directors of the London & North Western and Midland Railway Companies to inform you that, since the issue of their circular letter of March 17 last, announcing that a provisional agreement had been entered into under which, subject to the approval of the proprietors and debenture stockholders, the two companies were to be amalgamated into a new company as from January 1, 1923, further provisional agreements have been come to between the boards of the London & North Western, Midland, Furness, Glasgow & South Western, and Highland Railway Companies, under which these five companies will, with the consent of the proprietors and debenture stockholders of each company and the approval of the Amalgamation Tribunal, be amalgamated into a new company, as from January 1, 1923, the name of which will be subsequently decided upon."

It is now announced that the new company will be known as the London, Midland and Northern.

The circular continues :—

" These arrangements, if approved, will obviate the necessity of submitting to the Amalgamation Tribunal a separate scheme for the amalgamation of the London & North Western and Midland Companies as intimated in the third paragraph of the

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circular letter of March 17, the intention being to formulate one scheme embodying the London & North Western, Midland, Furness, Glasgow & South Western, and Highland Companies in a preliminary scheme of amalgamation under Section 8 of the Railways Act, 1921, which, *inter alia*, provides that, before any scheme is submitted to the Amalgamation Tribunal, it shall receive the approval of the proprietors and debenture stockholders of each railway company concerned. Meetings of the proprietors and debenture stockholders of the respective companies will be summoned at a later date, when the proposed scheme will be submitted for their approval."

Particulars were then given of the terms on which the several stocks of the five companies will be exchanged for stocks in the new company.

The Southern Railway.

THE terms on which it is proposed to exchange the stocks of the four constituent companies in the Southern Group into stocks of the new amalgamated company have been made public, and events affecting the grouping of the Southern companies to form the new "Southern Railway" (the title selected), may now be expected to move quickly. The scheme aims generally at giving to holders of debenture, preference and preferred ordinary stocks of the London and South Western, London, Brighton and South Coast and South Eastern Railway Companies the same income as they enjoyed in 1921, and to holders of the undivided ordinary and deferred ordinary an income estimated to be not less than that enjoyed for 1921. In the case of the London, Chatham and Dover Railway Company, the 4½ per cent. arbitration preference and the second preference stocks are on a different footing, the full yield on these stocks being of a more contingent character than is the case with the preference stocks of the other companies.

The new amalgamated company will have ten classes of stocks and securities: Terminable loans; 4 per cent. debenture stock; 5 per cent. guaranteed preference stock; 5 per cent. preference stock; two classes of 5 per cent. redeemable preference stock; preferred ordinary; deferred ordinary; ordinary A and ordinary B, making a total capital of £144,846,797, of which £52,740,374 will be allocated to the South Western Company, £35,584,393 to the Brighton Company, £32,165,107 to the South Eastern Company and £24,356,923 to the Chatham Company. Two new classes of stock, ordinary A and ordinary B, are created. The first goes entirely to Chatham arbitration preference and second preference stockholders, whilst the bulk of the ordinary B replaces "Chatham ordinary," the remainder going to satisfy the holders of certain contingent rights in the Brighton and South Eastern Companies.

The scheme for the preliminary amalgamation of the South Eastern and the Chatham Railway Companies, approved by the stock and debenture holders in both those companies last August, formed the basis of negotiations with the South Western and Brighton Companies. If the South Eastern and the Chatham stockholders approve of the proposed group terms we understand that it will not be necessary to submit the preliminary scheme to the Amalgamation Tribunal.

102 M.P.H.

IN the November number of our Great Western contemporary particulars are included of a report made by the late Mr. Charles Rous-Marten to the then General Manager of the Great Western Railway, Mr. (after Sir) James Inglis, in regard to the famous run with an Ocean Mail Special from Plymouth, when a speed of 102.3 m.p.h. was claimed for 4–4–0 engine No. 3440, *City of Truro*. In general the particulars now issued under official sanction will be common knowledge to readers of the RAILWAY MAGAZINE. In fact, in the June, 1904, number, the first published after the run was made, a complete log, as now published, was included in a special article by the late Mr. Charles Rous-Marten. No mention was, however, made of the fact that so high a maximum speed was reached, but in the June, 1906, number the quarter-mile times were given by Mr. Rous-Marten in his ordinary article, though only by inference could it be associated with the particular run. It has, however, been general knowledge for many years past that this speed was attained on this run, and in several editions of the *Railway Year Book* a paragraph to that effect has been included in the "Railway Miscellany," after having been given as a reply in "The Why and Wherefore" section of the RAILWAY MAGAZINE. Further, in the July, 1922, number of the RAILWAY MAGAZINE Mr. Cecil J. Allen discussed the run, comparing the times in detail with other notable examples of Great Western locomotive performance, incidentally pointing out an error made by Mr. Rous-Marten.

Although our Great Western contemporary is hardly correct in suggesting that their publication is a "revelation," it is of interest, in that Mr. Rous-Marten's "confidential" report to the General Manager is now made public under official auspices.

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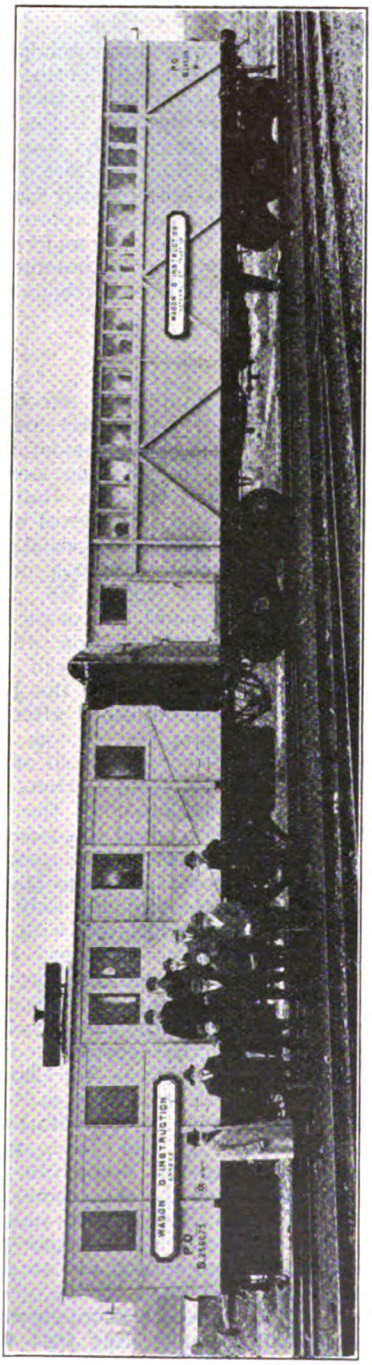

TRAVELLING INSTRUCTION CAR, PARIS-ORLEANS RAILWAY.

International Union of Railways.

THE establishment of a permanent body, to be called the International Union of Railways, is an event of considerable importance. The objects of the new body are the unification and improvement of European international railway traffic conditions. The first meeting, held in Paris, arose out of a discussion at the Genoa Conference. Excluding the French representation, there were at the meeting 70 delegates representing 30 administrations immediately concerned. The British delegation was particularly strong, numbering 11 and including Lord Claud Hamilton, Sir William Forbes, Sir Francis Dent, General Hildyard and Messrs. Herbert Marriott, C. Busk, F. A. Brant and Charles Cooper. We understand that much of the credit for the successful launching of the new union is due to Sir Philip Lloyd-Greame, the new President of the Board of Trade, who, as a co-delegate with Sir Francis Dent and Sir William Clark at the Genoa Conference, strongly urged the need for the establishment of a union to deal with international railway questions. M. Mange, one of the leading French railway managers, has been elected President of the Union, while the three vice-presidents will represent Britain, Germany and Italy respectively. The administrative work of the Union is entrusted to a Committee of Management, with headquarters in Paris, and French will be the official language. M. Mange was appointed president, while the three vice-presidencies were allotted to England, Germany and Italy. The committee is composed of Sir William Forbes, MM. Stieler (Germany), Sinigalia (Italy), Paul (France), Hanrez (Belgium), Kalff (Holland), Niquille (Switzerland), Flodin (Scandinavian Countries), Lankas (Czecho-Slovakia), Pereitzano (Roumanian - Jugo - Slavian group), Eberhardt (Poland-Baltic States) and Enderes (Austria-Bulgaria-Turkey). The Committee of Management will be assisted by five Commissions—(1) Passenger Traffic; (2) Goods Traffic; (3) Rebates and Exchanges; (4) Rolling-Stock Interchange and User; and (5) Technical Questions. General meetings of the Union, which officially commences to function on December 1, 1922, are to be held every five years.

Travelling Instruction Car, Paris-Orleans Railway.

FOLLOWING the British and American example the Compagnie du Chemin du Fer de Paris à Orleans, more commonly called the P.O., has recently established a travelling instruction "school." It is composed of two cars, one fitted for the instructor to live in, the other to serve as a lecture room, capable of holding 45 persons.

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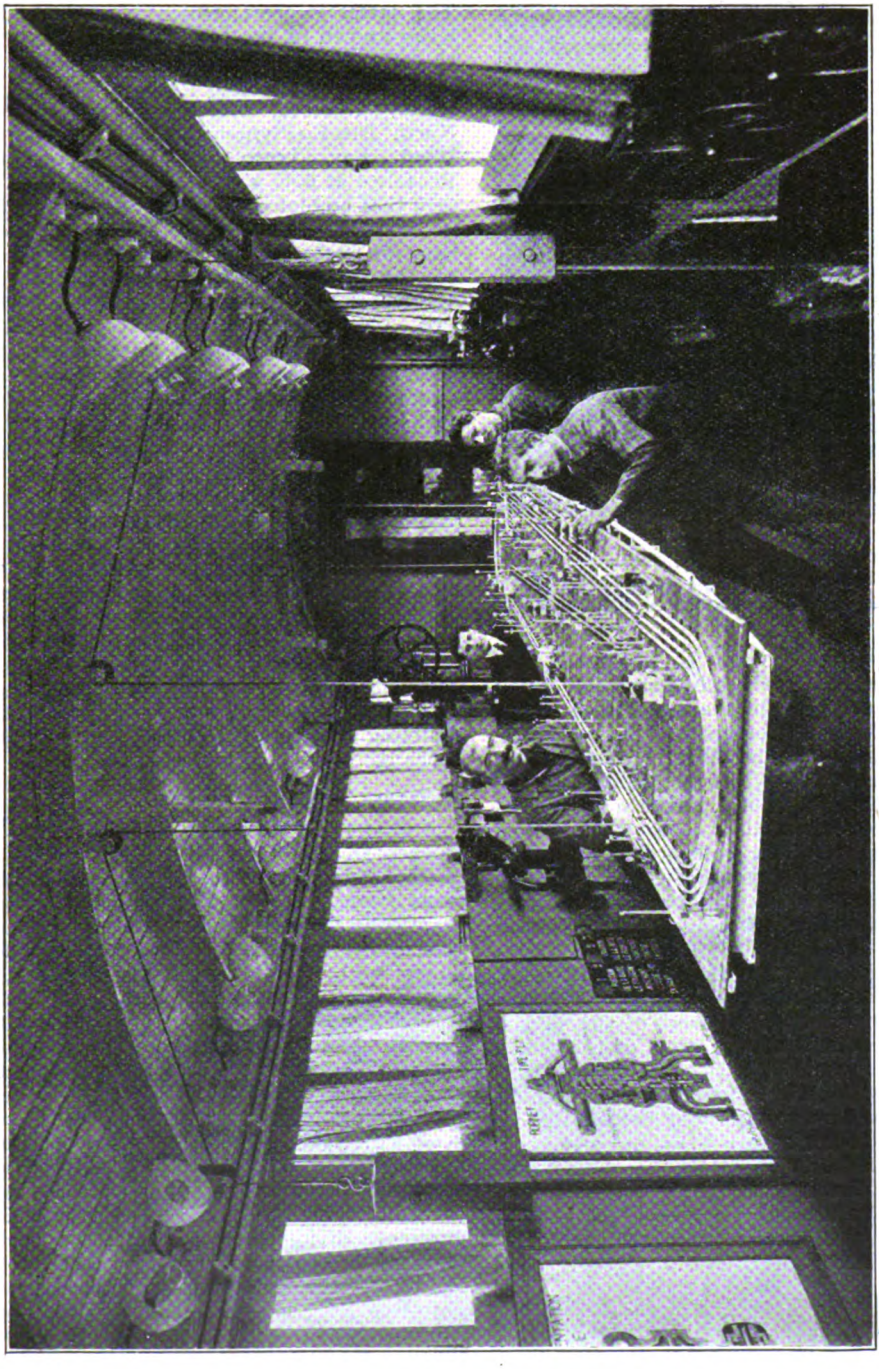

INTERIOR OF INSTRUCTION CAR, PARIS-ORLEANS RAILWAY, SHOWING TABLE ARRANGED FOR SIGNALLING CLASSES.

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Photo.] [*E. A. Gurney-Smith.*

PLACING MAIL BAGS IN POSITION AT MARAZION, GREAT WESTERN RAILWAY.

The "school" itself is equipped with models and charts which line each side of the car. On one side there are models in cross-section of the cylinders and valve gears. Opposite them stands a Westinghouse pump, the various brake devices, and an alarm signal with accessories. On a platform suspended from the roof is a model railway which can be lowered or raised by pulleys and four steel cables balanced by counter-weights. There are some 60 yards of miniature railway lines for illustrating the working of signals and operation of traffic. The designer has managed to find space for three double-track and three single-track stations, two junctions and 137 signals. The levers of the signal-boxes, the discs and the arms of the semaphores are worked by electricity which is supplied by a Stone dynamo in the adjoining car, this latter also supplying the lighting.

The instructor's car is fitted out as a combination of library, office and living room. His task is that of both lecturer and examiner, and he pays three or four visits each year to the chief centres of the system such as Tours, Nantes, Vierzon and Brives.

Postal Trains.

TRAINS conveying exclusively postal matter are comparatively rare in this country; in fact, there are probably only four in regular operation which do not also convey passengers—the up and down "West Coast Postal" expresses between Euston and Aberdeen, with their offshoots, and the service provided by the Great Western Railway between Paddington and Penzance. The latter express, which is perhaps the lesser-known of the two, leaves Paddington at 9.5 p.m., and calls at Reading, Didcot, Swindon, Chippenham, Bath, Bristol, Bridgwater, Taunton, Exeter, Newton Abbot, North Road (Plymouth), Saltash, Bodmin Road, Par, Truro and Hayle, reaching Penzance at 6.50 a.m. From this it will be seen that no high-speed running is attempted *en route*. In addition to the stops, mail-bags are exchanged by means of the apparatus at Southall, West Drayton, Slough, Maidenhead, Wantage Road, Hutton Bridge (for Weston-super-Mare), Tiverton, Collumpton, Totnes, Brent, Ivybridge, St. Germans, Liskeard, Lostwithiel, St. Austell, Grampound Road, Scorrier, Camborne, Redruth and Marazion. A similar route is made in the reverse direction, the Postal leaving Penzance at 6 p.m., and being due in Paddington at 3.55 a.m. The excellent photographs by Mr. E. A. Gurney-Smith, reproduced herewith, show the mailbags in position at Marazion ready to be picked up by the Postal, and also the actual moment of the exchange, with the bags just safely "scooped" into the folding net of the sorting van as it passes. As is customary, the bags are enclosed in stout leather pouches, as nothing less than this would stand the buffeting they receive in the course of the exchange.

A Severe Belgian Gradient.

A READER in Haverhill, Suffolk, wrote us recently in regard to the well-known incline on the main line of the Belgian State Railways from Liège to Brussels, which rises practically from the end of the platforms at the Guillemins Station at Liège, and extends almost without a break to Ans, desiring to ascertain the exact gradient. "I have travelled over the line many times," he stated, "while I was stationed at Cologne, and it always interested me to see how each train tackled what looked like a very severe task. We were always banked up it, but even with that help we have many a time failed to get up from a standing start without stopping. From what I could see I think the hill is in two portions of very steep gradient, divided by a stretch of slight gradient." We have been favoured by M. Defrance, the courteous London representative of the Belgian State Railways Administration, with a gradient profile of this formidable bank, which fully confirms these impressions. The steepest part of the incline below the short intermediate strip to which our correspondent refers is

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graded at 1 in 32, and of the upper part at 1 in 33, the average for the full 4.25 kiloms. (2.66 miles) being almost exactly 1 in 39. The actual difference of level in this short distance is 109 metres. Banking engines employed before the war were principally 0-8-0 tank engines, but on our last visit to Liège we noticed several large German 0-10-0 tanks, apparently of the Bavarian State design, so employed. The main line passenger trains between Liège and Brussels are worked principally by Prussian State four-cylinder compound 4-6-0 express engines.

British Railway Operating Statistics and their Lessons.

In his paper, read on Monday, November 6, before the members of the Institute of Transport, Sir William Acworth challenged the accusations of uselessness which have been advanced in several quarters against the statistics published by the Ministry of Transport. His main point was that "although statistics may be useless to the man who refuses or lacks the expert knowledge to use them," and in themselves they will not produce economies, they have great value and have been the means of directing attention to many facts which were either unknown or very imperfectly realised. A critic who complained that the train-load or truck-load on the Cambrian was not as large as on the Taff Vale, or that express speed was not as high on the Great North of Scotland as on the Great Northern, would not help to mend matters, but would merely exhibit his own incompetence. To use statistics rightly for purposes of comparison, we must know the facts behind the figures.

Sir William Acworth also traversed the claim that the compilation of statistics is unduly costly, challenging particularly "a ridiculous figure of £1,000,000 per annum" which "has got into the newspapers." He pointed out that our new statistics have made possible international comparisons on the basis of figures whose substantial accuracy no one will dispute, which were formerly merely matters of guess-work. He then gave some interesting figures of tonnage per route mile :—Great Britain, 900,000 tons per annum ; Austria, 750,000 ; Canada, 750,000 ; France, 670,000 ; Germany, 1,000,000 ; India, 600,000 ; Japan (narrow gauge), 800,000 ; Russia, 1,000,000 ; U.S.A., 1,650,000. These comparisons take no account of passenger trains, which are much more dense here than abroad, and Sir William quoted the following figures of passenger train miles per route mile per annum :—Great Britain, 11,000 ; France, 5,500 ; Germany, 8,000 ; U.S.A., 2,600. In regard to train loading, he suggested that the average goods train load is as follows :—Great Britain, 130 tons ; Austria, 200 ; Canada, 400 ; China, 250 ; France, 150 ; Germany, 225 ; India, 200 ; Japan (narrow gauge) 140 ; U.S.A., 650.

What is a Train?

Various aspects were discussed in detail and the paper as a whole was distinctly interesting, besides affording much food for

Photo.] [*E. A. Gurney Smith.*

EXCHANGING MAIL BAGS AT MARAZION, GREAT WESTERN RAILWAY.

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serious thought. Sir William concluded by remarking that "if the railway men will only take the traders into their confidence and help them to see that, by their demand for pre-war conditions of freight traffic, they are forcing the railways to charge them 5s. for conveniences that are possibly worth 1s., I see no reason why ere long we should not have as good right to be proud of our operating methods in freight service as we are at present in relation to passenger traffic."

In the course of the discussion Sir Sam Fay, President, drew attention to the importance of properly defining "a train" for statistical purposes. The operating figures of British railways now being furnished by the Ministry of Transport appear to regard as "a train" every traffic movement of 40 chains in length or over, and this definition affects the reliability of comparisons with America and other countries in the matter of average speed of goods trains, as it does not take into account the difference in conditions. There are many more private sidings here than in America. On the Great Central, for instance, there are 240 stations, but 480 private sidings, the latter rendering necessary many shunts of over 40 chains in length, on which high speed is impossible of attainment. These so-called "trains," of course, bring down the average train speed in this country. Sir Sam Fay also combated the deduction, apparently made by Sir William Acworth from the figures, that there was some connection between short trains and low speeds. On the Great Central and the former Lancashire and Yorkshire Railways the trains were long, but the average speed was low because their lines were congested. Mr. T. A. Kenyon and Sir Sam Fay also raised the question as to whether the comparatively small average train-load of 130 tons shown in the statistics was not due to the fact that empty trains were included in the calculation.

End of the North British Dispute.

THE dispute between the North British Railway Company and the Ministry of Transport has been settled on terms which permit of the payment in full of postponed dividends for the years 1920 and 1921. It will be remembered that while all interim dividends down to and including the 3 per cent. preferred ordinary were paid for the first half of 1920, payment of the preferred ordinary dividend declared for the second half of 1920 and of the deferred ordinary dividend of 1¼ per cent. declared for the year 1920 was postponed pending a settlement of the dispute. For 1921 no dividends were declared, pending a settlement, on the preference stocks ranking after the convertible preference 1884, or on the preferred or deferred ordinary stocks. The trouble arose with the Ministry of Transport deducting £430,000 from the company's claim for repairs in the month of December, 1920, further deductions being made of £690,000 for the period January 1–August 15, 1921. The Railway and Canal Commission ordered the Minister, on the merits, to pay the £430,000. It was, however, decided on appeal that the Minister's discretion as to the monthly payments during control was absolute, and was not subject to review on the merits by the Commissioners.

The Leckhampton and Gloucester Tramroad.

IN the November, 1921, RAILWAY MAGAZINE this line was referred to in "Pertinent Paragraphs," on the basis of notes contributed by Mr. C. F. Klapper, a specially drawn map being reproduced. Important changes are now in progress, while the inauguration of work on the new Leckhampton–Charlton Railway on October 7 lends further interest to additional remarks contributed by Mr. Klapper as follows:—

"Leckhampton Hill forms part of the oolite ridge, or the western escarpment of the Cotswolds, and the limestone at this point is of very fine quality. In the middle of the eighteenth century some sort of tramway was laid in the quarries, but the date and form of construction seems uncertain. It was probably a stone way or else laid with wooden rails, of 3 ft. 6 in. gauge. This did not operate outside the quarries and was laid merely to facilitate loading into road vehicles.

"In the early part of the nineteenth century the railway era was foreshadowed by numerous tramroads laid to connect quarries and mines with places for shipment of their products by water, and many of these, such as the Surrey Iron Railway of 1801, were not merely built for private use but for the use of the general public, and were authorised by Acts of Parliament. Such a line was that promoted by prominent inhabitants of the Gloucester and Cheltenham districts, to connect the county town and port with what was already coming to be considered as the social centre of the county, and also to give the quarries at Leckhampton access to water transport at Gloucester.

"The line was authorised by an Act of 1809 (49 Geo. III, cap. 23) to run from Severn Quay at Gloucester to Knapp Toll Gate, Cheltenham, via Littleworth, Wooton (then spelt Wotton), Barnwood, Churchdown, Staverton and Arle, and there was to be a branch from Nine Acres Field to the top of Leckhampton Hill 'near to a railway or tramroad there already laid down.' The doings of early experimenters with the loco-

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motive had been noted, as other means than man or horse haulage were provided for in the Act, although use of a locomotive would have not proved very successful on the cast-iron flange rails employed, and doubtless it was never tried. The system of construction was to be the edge-rail, and where crossing public roads the 'ledge or flanch of such railway . . . shall not exceed one in. in height above the level of such road.' Gauge was not specified, but the line was made on the 3 ft. 6 in. gauge to accord with the line already made at the quarry. This Act was passed on April 28, 1809."

Great Western & Midland Railway Interests.

"THE company by the first Act raised £25,000 and borrowed £10,000, but this was all spent and heavy debts incurred by 1814. Another Act was then obtained for the purpose of raising further money—£15,000. This Act was passed in 1815 (55 Geo. III, cap. 41). The tramway was probably constructed in time to carry the stone for Gloucester Shire Hall which is mainly built of Leckhampton materials and was completed about 1817. The Act 22 and 23 Victoria, cap. xl, arranged for the purchase of the greater part of the line by the Great Western and Midland Railways and the abandonment of such parts as were not covered by the present-day line from Cheltenham to Gloucester. The purchasers were empowered to sell the lands of those sections not required. The two companies mentioned were of course successors to the Cheltenham and Great Western Union and Birmingham and Gloucester Railways respectively. Although the Cheltenham and Gloucester section is jointly operated for traffic purposes, the section from Gloucester to Churchdown is owned and maintained by the Midland Railway and the Great Western merely has running powers over this section, whilst the Midland has only running powers between Churchdown and Lansdown Junction, Cheltenham. Churchdown is the only station, and is mainly served by Great Western trains. Since 1859 the only section of edge railway left has been from the site of the present post office in Leckhampton Village to the top of Leckhampton Hill—about a mile. The original length of line was 10½ miles, and of these 2¼ composed the Leckhampton branch. More recently the stone works were moved nearer the quarry, and the five or six hundred yards of intervening line removed. A double hedge running alongside the road for some distance, about six ft. back, serves to mark the route."

Present-day Conditions.

"AT the time of the writer's last visit to the line in August, 1922, working had practically stopped for twelve months, owing to its high cost. The stone is at present being brought down by steam lorry. The inclines are four in number and serve three levels, on each of which horses and men were required for the working. The inclines are all designed for the descending load to raise empties, and below the half-way point the track becomes single. The grade varies from 1 in 5 to 1 in 3; as the line is largely on the surface there is a great deal of variation. In the big quarry beside the cranes the year's working had revealed a number of tracks more or less dilapidated, which had formerly been hidden, but the incline up to this quarry was badly damaged and the rails, here laid on transverse and longitudinal sleepers, hung over quite an impressive precipice. On top of the hill, what remain of the tracks are partly on wooden piles and partly on longitudinal sleepers, but there are a few original stone blocks left. Some four miles of track are estimated to remain, and rails vary in length considerably. Very old cast-iron ones, 2 ft. long are to be seen; but 6, 9, and 16 ft. are also common lengths. Some modern rails used for relaying are of quite heavy steel section and 30 ft. long. In these days an order for rails of L-section is a considerable rarity.

"Ascending the incline to what is known as the Middle Jenny, we noticed three wagons loaded at the foot of the 1 in 5, where there is a passing place. The inside measurements of the wagons are: length, 5 ft. 10 in.; width, 3 ft. 10 in. The wheels, which are, of course, flangeless, are 18 in. in diameter, with 1-in. treads. Springing is not provided, and the wooden bodies were much damaged. They were considered capable of a 40–45 cwt. load at a pinch, but the average load carried was 36 cwt. The road-bed is washing out on this gradient and particularly on the 1 in 3 section at the top, which forms quite a water-course in wet weather."

The Charlton Kings and Leckhampton Light Railway.

"THE lover of the antique in the railway world must rest content with the assurance that if it is found possible a section of the line will be preserved in view of its lengthy historical associations. The modernist at Leckhampton will find more of interest in the works now proceeding on the construction of a railway from Charlton Kings station on the Cheltenham–Kingham section of the Great Western Railway across Lilley Brook Park to Leckhampton Hill. This line is one mile in length. As did their predecessors, the present proprietors of the quarries realise the superiority of the light railway over the road for heavy traffic. A grant of £50,000 is being

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made to the Leckhampton Quarries Company, Limited, under the Trade Facilities Act, for the construction of the line and the provision of up-to-date stone machinery and lime kilns at the quarries. Electric hauling will be the rule over the steep final grades to the Middle Jenny. Villages south of Leckhampton Hill such as Birdlip and Seven Springs (one of the sources of the Thames) which are somewhat inaccessible from present railways will also be benefited. The sod-cutting ceremony took place on October 11, 1922, when Dr. Macnamara, then Minister of Labour, turned the first sod. The contractors for the new railway are Messrs. Caffin and Company, working

assistants. The trip commenced at Melton Constable, where several excellent examples are installed, including a massive four-armed signal post, gates and gateposts, an overbridge, signal box, buffer stops, telegraph, &c., poles, sleepers and other items, after viewing which the party proceeded to Norwich in an official saloon propelled by one of the 4-4-0 type side tank engines. On the way several other objects of interest were passed, including concrete gatehouses, platelayers' huts, &c., whilst on arrival at Norwich inspection was made of a large goods transhipshed, which has been rebuilt, concrete taking the place of timber, which latter had reached

4-4-0 TANK ENGINE AND INSPECTION SALOON, MIDLAND & GREAT NORTHERN JOINT RAILWAY.

Mr. W. Marriott, Traffic Manager and Engineer, in centre of Group.

under the direction of Mr. A. B. Searle, consultant, and Mr. G. W. Blackall, engineer. The writer expresses his thanks to Major N. L. Fawcett and also to the Town Clerk of Gloucester, Mr. G. S. Blakeway, for their kindness in placing at his disposal a considerable mass of information.

Reinforced Concrete on the Midland and Great Northern Joint Railway.

On a recent occasion when Mr. Wm. Marriott, Traffic Manager and Engineer of the Midland and Great Northern Joint Railway, was making a short trip over a section of the line for the purpose of inspecting various structures erected at several points and built of concrete, reinforced and otherwise, on the Marriott system, he was accompanied by three of his former pupils as guests, in addition to two of his leading engineering

the stage at which renewal or reconstruction was definitely called for.

The photograph reproduced herewith shows Mr. Marriott and the other members of the party. Their names reading from left to right are Mr. T. Bell, Locomotive Foreman, Mr. A. E. Langley, Assistant, Engineering Section, Capt. F. J. Rouse*, Mr. Marriott, Mr. C. S. Lake*, Mr. H. E. Roberts*, Mr. W. E. Newman, Assistant, Locomotive Section.

The Oldest London Suburban Passenger Locomotive in Service.

In sending a photograph of 4-4-0 tank engine No. 109, North London Railway, Mr. H. L. Hopwood supplies interesting particulars as follows :—

"Built so long ago as 1865 and still

* Former pupils of Mr. Marriott.

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regularly running, engine No. 109 of the North London Railway has now attained the respectable age of 57 and is famous as being the oldest locomotive employed on suburban trains of any railway in the London district. No. 109 is noteworthy for another reason: it played the leading part in the Wood Green accident of 1895.

"This engine is one of a class of 18, originally numbered 11, 12, and 51 to 66, and built at Bow Works between 1865 and 1869 to the designs of the late William Adams. Most of the engines were afterwards rebuilt (between 1883 and 1890) and all of them were re-numbered 101 to 104 and 109 to 122. Nos. 104, 111, 115, 116, 119, 121 and 122 were broken up 30 years ago and the others more recently, except No. 109, which is the sole survivor on the North London Railway, and Nos. 101 (built 1867), 114 (1866) and 117 (1867), which were sold in 1909 to the London and North Western Railway and became Nos. 2647, 2648 and 2649 on that line. The three latter engines are stationed at Willesden and frequently work over the North London Railway.

"As rebuilt, this class has inside cylinders 17½ in. by 24 in. and four coupled wheels of 5 ft. 11 in. diameter. The boiler provides a heating surface of 1,141 sq. ft. and works at a pressure of 160 lb. The weight is officially given as 51 tons, though at the time of the Wood Green accident, No. 109 scaled only 49 tons 13 cwt., viz., 14 tons 8 cwt. on the bogie, 18 tons on the driving, and 17 tons 5 cwt. on the trailing, wheels. The most noticeable feature of this class of engine is the recess in the side tanks over the driving wheels; the semi-circular openings being finished with brass beading.

"The Wood Green accident, already referred to, occurred on the morning of February 28, 1895, the circumstances being as follow:—No. 109 engine, running bunker first, was working the 7.40 a.m. train from Dalston (which was a passenger train to Finsbury Park and empty coaches thence to Bounds Green sidings) and when approaching the western side of the down island platform at Wood Green, the leading axle broke inside the boss of the right-hand wheel (in reality, the left-hand trailing wheel, but the engine was running in backward gear at the time). The engine had safely passed the facing points between the down slow and down Enfield lines, but immediately afterwards the right-hand leading coupled wheel became detached, and the engine ran for about 100 yards on seven wheels, the check rail keeping it on the track. On reaching the platform, however, the corner of the frame struck the ramp and rode up it, which caused the engine to fall on its side across two running roads. The fall caused the same axle to fracture in a second place—this time, close to the left-hand wheel. The bogie was also sheared off, so that, finally, only the driving wheels remained attached to the engine. In the meantime, the first detached wheel, with coupling rod, ran for some distance and then

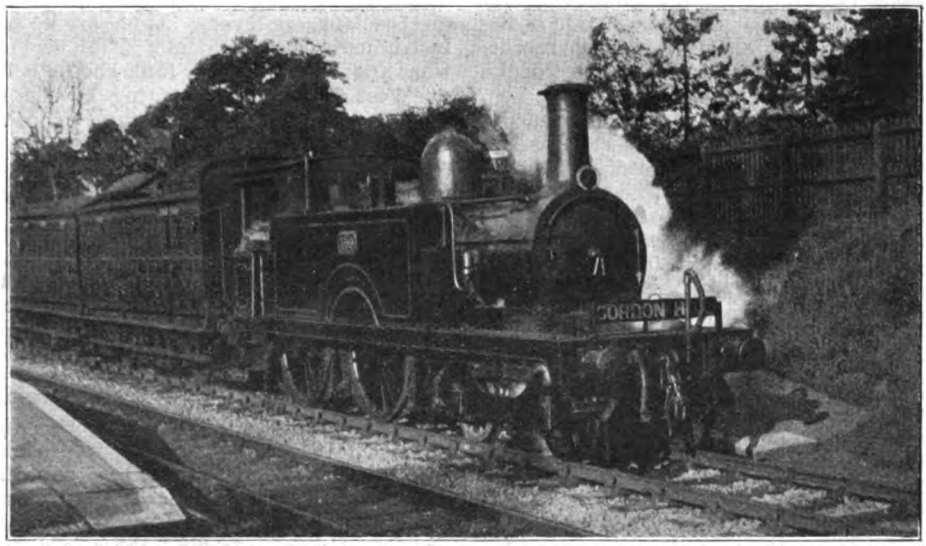

Photo.] NORTH LONDON RAILWAY. [*H. L. Hopwood.*

Old 4-4-0 tank engine (inside cylinder class), No. 109, at Palmers Green.

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fell foul of the down slow road, but was promptly removed. The two leading vehicles of the train were derailed, but the remainder kept to the track and were undamaged. The driver, Charles Floyd, and the fireman, Edward Cowland, were crushed to death. The first named had closed the regulator and applied the brake before attempting to jump clear, but—according to an eye witness—he was caught by the cab roof as the engine turned over.

"At the time of the accident the axle was 25½ years old and had travelled 578,020 miles. It had run under more than one engine before being transferred to No. 109 in November, 1887. The engine itself had been rebuilt in 1886. On examination of the axle, a previously existing, though recent, fracture was discovered inside the boss of the wheel, and therefore not visible to the eye. The engine had safely negotiated the facing points at Wood Green, but as soon as the right-hand wheel felt the lateral pressure due to the curvature of the line towards the left, the axle broke off close to the point where it was already weakened by the previous fracture. A severe frost which had prevailed for some time was also partly responsible for the breakage.

"Following its severe damage, No. 109 was repaired, and to-day, 27 years after the mishap, is still at work, having, with its three slightly younger sister engines, now on the London and North Western Railway, survived all others of its class. The photograph reproduced shows No. 109 standing in Palmers Green station when working the 7.3 a.m. train from Broad Street to Gordon Hill on a recent date."

The West Bridge (Leicester) Branch of the Midland Railway.

"MIDLANDER" points out that what is said to be the oldest railway tunnel in the world is on this branch of the Midland Railway, part of the original Leicester and Swannington Railway. The tunnel is situated between West Bridge and Glenfield, about 100 yards on the West Bridge side of the latter. It is 1 mile 36 yards in length, and is perfectly straight. It will be remembered that the Leicester and Swannington Railway was opened on July 14, 1832, and is, therefore, one of the oldest lines in the world. Its length is 6½ miles and is single tracked throughout, connecting with the Leicester and Burton branch at Desford Junction. The section is worked on the train staff system, with one engine in steam. At present there are two passenger trains each way daily, and about four coal trains. Owing to the limited dimensions of the tunnel the 0-6-0 No. 2 class goods locomotives are exclusively employed. The passenger trains usually consist of four old-pattern six-wheeled vehicles, still lighted by oil and having bars placed across the carriage door windows to prevent passengers from putting their heads out while passing through the tunnel, the side lamps being only about two in. from the wall when passing through. In addition to West Bridge, other stations on the branch are Glenfield and Ratby, the station at Desford being about half-a-mile beyond the junction. As one engine in steam only is allowed on the branch, there is no need for signals except to protect level crossings at intermediate stations. The only signal cabin is at West Bridge where there are two working levers. There are no block instruments. "Midlander" further mentions that a 0-6-0 goods tank engine is kept at West Bridge for shunting in the coal sidings, as the bulk of the coal consumed in Leicester is dealt with here.

"Robinson's Railway Time Table," 1841.

REFERRING to the "Pertinent Paragraph" under this title in the September RAILWAY MAGAZINE, Mr. T. R. Perkins suggests that our contributor is in error in stating that the "Wolverhampton" station of 1841 was afterwards "Bushbury Junction." He explains that the latter (now closed) was about 1¼ miles west of the original "Wolverhampton" station, situated on the direct line from Portobello Junction to Bushbury Junction, close to the modern suburb of Heath Town and considerably more than a mile from the town itself. "The tiny station building still stands, and there is a goods station still in use. One passenger train each way now passes along the old line and by the old station—the through express between Manchester and Bournemouth, booked non-stop between Crewe and Birmingham. Near the old station is a short tunnel, over which the Wolverhampton–Walsall line of the Midland Railway passes; on this line there was until a few years ago, a station at Heath Town, but (as at Bushbury) tramway competition resulted in its closing, and no trace of it now remains."

With regard to the Brandling Junction Railway, Mr. Perkins points out that, according to Tomlinson's "History of the North Eastern Railway," the line ran from Gateshead to South Shields and Monkwearmouth; to get to Durham the lines of the "Stanhope and Tyne" and the "Durham Junction" railways were used, connecting at Brockley Whins with the "Brandling Junction." It is curious that the last-named railway was named after two brothers—Messrs. Brandling, who projected the line.

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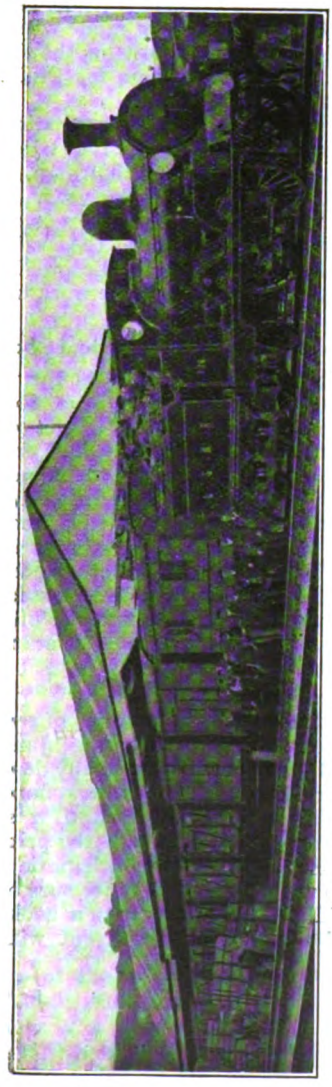
The Locomotive Booster.

On more than one occasion reference has been made to the fact that in the United States the power of individual locomotives is being increased by the adoption of a device known as the "booster," consisting of a small reciprocating steam engine suitably connected to the idle trailing wheels of certain types of locomotives, and brought into action at starting and on grades, and whenever greater output of tractive force is required. A recent development consists of a booster engine applied to the rearward bogie truck of an eight-wheeled tender fitted to a locomotive of the 2-8-0 type. The wheels of the bogie are equipped with outside cranks and side rods, the reciprocating booster engine being arranged to drive one of the axles. This may be regarded in a sense as a revival of the Sturrock steam tenders adopted many years ago in this country, the principal difference between the two consisting of the fact that whereas in the latter instance the engine could only be deprived of its driving power by shutting off the steam, the booster engine can be cut out altogether by throwing out an intermediate gear pinion. This does not, however, interrupt the motion of the cranks and side rods, which continue in action so long as the wheels are moving, a feature which may be considered by some a weakness in design. The booster cannot be started except when the main regulator valve is open, and the closing of this valve automatically throws it out of gear. It is hinted that in future designs both of the tender trucks may be employed for tractive purposes instead of as at present only one.



FISH TRAIN AT PADSTOW, LONDON & SOUTH WESTERN RAILWAY.
Worked by Adams 0-4-2 tender locomotive.

Fish Traffic at Padstow.

Padstow, served by the London and South Western Railway, is rapidly becoming one of the chief fishing ports, certainly in the West Country, if not in the British Isles. It is the most westerly station on the London and South Western system and was known as a port as far back as the thirteenth century and was probably in those early days accessible to larger craft than use it to-day, although during recent years the berthing and other facilities for shipping have been very considerably improved, so much so that Padstow has become a favourite fishing port for some of the East Coast steam trawlers between the seasons of their own waters. The principal fishing season for Padstow is in the spring, before the summer visitors arrive, and some idea of the volume of traffic then dealt with and the revenue derived therefrom will be gained from the following figures, which will also no doubt come as a surprise to many.

"During the brief season of about eleven weeks, which ended in May last," writes Mr. G. Roberts in the *South Western Railway Magazine*, "over 40,000 packages of fish were dispatched, weighing 2,500 tons, with a rail charge of over £10,500, to convey which 750 special vehicles were required, and 737 trucks of coal for bunkering the fishing fleet, nearly 500 tons of ice and 300 truck loads of empty boxes, &c., were received. During the season some 52 trawlers used the port, and their crews, with the workers employed on the market, raised the population of the town by over 500 persons, so that it may be readily seen how largely the general business of the place is also increased by the fishing fleet."

Federated Malay States Railways.

In his report on the Federated Malay States in 1921, Mr. W. George Maxwell,

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C.M.G., Chief Secretary to the Government, states that the receipts on the railways, from all sources, amounted to £1,889,816, a decrease of 6·45 per cent. on the previous year, whilst revenue expenditure on all accounts amounted to £1,831,302, a decrease of 6·31 per cent. There was thus a net profit on the year's working of £58,514 compared with £65,704 in 1920. This represented 0·29 per cent. on the capital expenditure, against 0·39 per cent. in the previous year.

Goods rates were increased from January 1, and additional revenue to the extent of about £117,000 was produced. Without this there would have been a loss on the year's working.

The number of passengers carried was 10,551,115, being a decrease of 21·27 per cent., and passenger receipts decreased by over two million dollars (23.53 per cent.) There were no fatal accidents to passengers and only nine cases of personal injury. Between the Federated Malay States and Siam, passenger traffic fell off, but there was a large increase in the goods traffic, chiefly in rice, padi and bran. The total mileage of running lines at the end of the year was 1,021 miles; this includes the Johore leased line, but not sidings.

Two new stations were opened during the year, and eight "halts" were converted into permanent stations. Running costs per engine mile have decreased from 64 c. in 1920 to 59 c. (the dollar has a fixed value of 2s. 4d.). The steamer and ferry services showed a profit of £8,565, as against a loss of £9,747 in 1920, but there was again a loss under the heading of "Docks, Harbours and Wharves." Forty new locomotives arrived during the year. There are 233 locomotives on the open lines.

During the year, the expenditure on capital account amounted to £3,482,353. Of this expenditure, roughly £817,000 was on construction of new lines, £1,870,000 on widenings and additions (including Prai Wharves and Johore Causeway), and £612,500 for new rolling-stock.

Good progress was made on the bridges in the Pahang-Kelantan section, but, owing to the financial situation in Malaya, work had to be slowed down towards the end of the year.

Topham, Jones and Railton made good progress with the construction of the jetty and other works at Prai (opposite Penang). Progress on works additional to the wharves was greatly impeded by the necessity for reducing expenditure. The filling of the northern reclamation was started as soon as the site was partly filled; 29,668 cubic yards of stone were delivered for the filling of the southern reclamation bounds.

The same contractors have maintained satisfactory progress with the Johore Causeway. The construction of the lock at Johore proceeded day and night throughout the year, the north wall, with the exception of coping and surfacing, being completed as well as the east wing wall, as far as the power house. The deposit of rubble continued regularly.

Work on the Penang Hills Railway progressed steadily, but at a reduced rate. Progress was also made with doubling the line in Singapore Island, the Port Swettenham line and the Sungei Besi line, and with the new railway station at Fort Canning (Singapore), but, owing to the financial situation, work was curtailed as far as possible. Good progress was made with the Teluk Ayer godowns. Work on the Bukit Serayah water supply scheme for Prai was carried on at a reduced rate.

A railway advisory board, consisting of seven members, including the General Manager for railways as chairman, was formed towards the end of the year. The powers and duties of the Board are confined to matters which concern the railway administration in relation to the public, as distinct from the administrative work of the department.

Railway and Locomotive Historical Society.

WE are informed that copies of the three Bulletins so far published by the Society (which have received attention in our pages) can be obtained at the following prices: Bulletins Nos. 1, 2 and 3, to members, respectively 50 and 75 cents. and $1.00, and, to non-members, respectively, 75 and 90 cents. and $1.25. Mr. J. H. Gaitskell, of Gladstone House, High Street, Rocester, Staffs, writes that he will be pleased to supply particulars of membership of this Society to anyone sending a stamped addressed envelope.

Scottish Railways.

IN accordance with the practice of several previous years the forthcoming January RAILWAY MAGAZINE will be specially devoted to Scottish railways. There always has been an exceedingly satisfactory demand for issues of this character, and although the printing order will be increased in anticipation the reader who wishes to make quite sure of his copy should place his order with a bookstall manager, bookseller or newsagent without delay.

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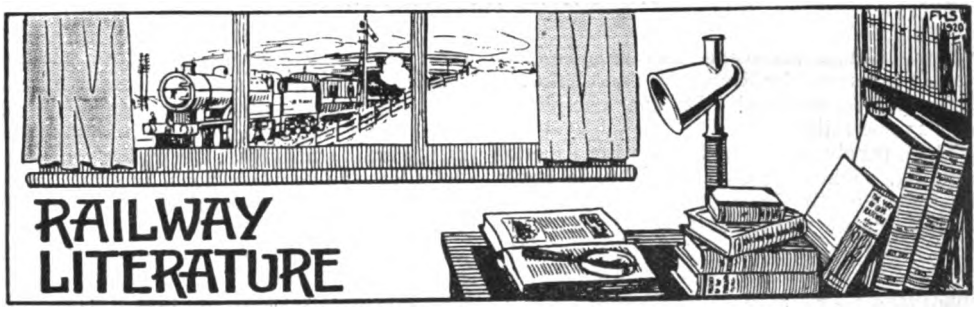

THE WONDER BOOK OF RAILWAYS. Edited by Harry Golding. [Ward, Lock & Co., Ltd., London and Melbourne. Price 6s.] A new and revised edition (the tenth) of this remarkable book for boys and girls has just been published. It contains twelve colour plates and nearly three hundred other illustrations referring to railways at home and abroad. Bound in substantial boards and printed on good paper in easily-read type, it includes no fewer than 256 pages of large size, 9½ in. by 7 in., to be exact, and every page is full of real live interest.

Although primarily intended for the use of the young, " grown-ups " whose knowledge of steam and electric traction is not all they would wish it to be will find in it a mine of information presented in a pleasant and easily-assimilated form. In short, it is a work paterfamilias may purchase for his small son, and at the same time find therein no small amount of satisfaction, to say nothing of increased knowledge, for himself.

In striking this happy mean in book production, the editor, Mr. Harry Golding, is a past-master, and in " The Wonder Book of Railways " his genius is most excellently portrayed. The first chapter, " What Makes the Engine Go ? " is a model for all who desire to explain and make attractive a particularly technical subject to a non-technical person, quite irrespective of the age of the latter. The same remark may be applied to such chapters as " Signals and Signalling," " Engine Building and Repairing," and " Electric Railways." Other subjects, such as " Railway Head Codes " and " Staff Signals " are dealt with in clear and illuminating style. One must not, however, attempt to be discriminating for each chapter has its own particular fascination and attractiveness.

The frontispiece is a folded colour plate, illustrating the interior of a Great Western 4-6-0 locomotive, and by its aid the student of the locomotive can identify by name the parts of the engine to the number of one hundred. Another very fine colour picture is one of a Great Northern Railway train hauled by the first of the new " Pacific " type locomotives put into service this year. This is an indication of how very up to date this new edition is, although it is pleasing to note that illustrations of some old favourites, such, for example, as the Great Western Railway *Great Bear*, are retained.

The book doubtless will be in great request as a Christmas gift for the youthful railwayist, and with this end in view, to meet the requirements of our readers, it is being stocked at the RAILWAY MAGAZINE offices. The price by post is 7s.

THE MODEL RAILWAY HANDBOOK. [By W. J. Bassett-Lowke, M.I.Loco.E. Bassett-Lowke, Limited, Northampton, &c. Price, 2s. 6d. net].

This is a revised and enlarged edition—the seventh—of Mr. Bassett-Lowke's practical guide to the purchase and installation of the equipment of a model railway. It is profusely illustrated, including a page portrait of the author, and without being a scientific treatise, it comprehends just the information requisite and necessary to the potential purchaser of a model locomotive or the builder of a model railway.

First and foremost comes the choice of scale and gauge of railway, and then must be considered the relative advantages and disadvantages of the three types of locomotive propulsion—clockwork, steam and electricity. These points are discussed by the author with commendable clarity and he is equally praiseworthy in his chapters dealing with track, railway planning, signalling, rolling-stock, buildings and accessories.

Although the book does not profess to be an encyclopædia, the author is entitled to claim that it is a sound, practical and reliable guide, in a concise and inexpensive form, to purchasers of model locomotives and railway equipment.

From RAILWAY MAGAZINE readers, the illustrations, no less than the reading matter, will receive a welcome. The frontispiece depicts a 4-6-2 " Pacific " type locomotive, *Colossus*, originally built for Mr. J. E. P. Howey, from designs by Mr. Henry Greenly, for use on the Staughton Manor Railway. This engine, purchased during the war by

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Narrow Gauge Railways, Limited, is constantly in use on the Ravenglass and Eskdale Railway, Cumberland. It has completed over 25,000 miles.

The revolution in locomotive model building, engineered by the author is aptly illustrated at the head of the first chapter, by pictures underlined respectively "Before Bassett-Lowke" and "Since Bassett-Lowke." To describe the upwards of 200 illustrations in detail is impossible in the space at disposal, so suffice it to say that in addition to those of mechanical, historical or other interest, the plans of stations, permanent way and locomotive parts far transcend in value the modest price asked for the book.

SCALE MODELS. [Section "A" Model Railways. Bassett-Lowke, Limited, Northampton, &c. Price, 1s. 6d. net.]

Although called a "catalogue"—and we do not dispute the accuracy of the description—this book goes far beyond what is expected of a publication so designated. Profusely illustrated by pictures of model locomotives and railways, that are surprisingly like the real things, the book will command the attention of that very wide circle who delight in model railways, steam, electric and clockwork locomotives, carriages, wagon stock, station buildings, and general equipment for model railways. The book is right down-to-date and only just published as we go to press. We have pleasure in directing attention to its merits as its possession will serve as a guide to those who desire to make themselves acquainted with the enormous interest taken by the rising generation in railway working, both steam and electric, and the suitability of a model railway, in one of its many forms, as a gift for Christmas.

RAILWAY PERMANENT WAY DIMENSIONAL THEORY AND PRACTICE. By William Hepworth and J. T. Lee. [Published by Charles Sever, 40, King Street West, Manchester. 425 pages. 194 diagrams. 7 photographs. 50 tables. Price 12s. 6d., or 13s. post free.]

This volume is described as a handbook prepared for the use of all concerned in the construction and maintenance of the permanent way of railways designed to supply ready and accurate means of dealing with the problems of a dimensional nature which arise in the planning and laying of track in correct alignment, and to set forth the proper use of the manufactured parts of which it is composed. It is, of course, intended for practical men, and to meet most of the requirements of the drawing office. The greater proportion is also of interest and should be useful to foremen, gangers and others who require to have at least a general knowledge of the theoretical and engineering aspects of their work. It is methodically arranged, beginning with clear definitions and explanations, and thus leading up to ordinary mathematical and geometrical aspects of track work. Several chapters deal with the setting out of curves and the peculiar problems of curved track. Further chapters deal with points and crossings and various types of switches and junctions. A large number of tables are included, so that in one volume the user has not only the problems and methods of dealing with them, but also the mathematical data required for the calculations involved. British practice is primarily considered, and, apart from anything else, the amount of technical data and tabular matter is noteworthy. Diagrams and illustrations are freely included. We understand that a number of well-known railway engineers have expressed very favourable opinions of this volume, which, as far as we have been able to consider it in detail, are fully justified. A useful bibliography is included.

RAILWAY AMALGAMATIONS UP TO DATE. [F. C. Mathieson and Sons, 16, Copthall Avenue, E.C. 2. Price 6d.]

This is No. 4 of a series of booklets issued by the publishers mentioned, dealing with the progress of railway amalgamation. The requirements of the Railways Act of 1921 are set forth, and particulars given of the amalgamations specified thereby. Information is then given as to the financial arrangements as far as yet made public.

BRITAIN'S DECLINE: HER ECONOMIC DISORDER AND ITS ONLY REMEDY. By John W. Lea, with a foreword by Sir Arthur Steel-Maitland, Bart., M.P. [Birmingham: Cornish Bros., Limited, 39, New Street Price 1s. net.]

This book consists largely of reprints of newspaper articles by the author and it deals without political party prejudice with the prevailing economic stringency. Under the heading of "The Depreciation of British Home Investments," railways come into notice and comparisons are made with French railways. Thus it is noted that in 1896 British railway debenture stocks were selling at much higher prices than the corresponding French stocks and for the last six years the latter stocks have been fetching higher prices than the British.

For the student of economics the book may be recommended as well worthy of a place on the bookshelf.

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We regret to record the death, on November 6, of Mr. Andrew Lamb, Assistant Superintendent of the Line, Great Northern Railway. Mr. Lamb, who was in his 46th year, entered the service in 1891 and after experience in various capacities in the provinces was transferred to headquarters at King's Cross in 1897. In 1906 he was placed in charge of the excursion section of the Superintendent's office and a few years later he was appointed chief of the Special Traffic Section. Two years ago he became Assistant Superintendent of the Line.

* * *

On November 6, passed away at the age of 76, Mr. John Wilson, who was Chief Engineer of the Great Eastern Railway from 1883 to 1909. Among the works with which he was particularly identified were the Metropolitan Extension of the Great Eastern Railway, the Ipswich and Felixstowe Railway, and the East Norfolk Railway from Wroxham to Aylsham. Mr. Wilson was a Past-President of the Permanent Way Institution. When in active service he was always mindful of the welfare of the staff under him and to the end of his life he maintained a keen interest in railway workmen.

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By the death of Mr. Edwin A. Pratt, a member of the editorial staff of the *Railway Gazette*, a well-known writer on economic and industrial matters, with special reference to railways and transport, has passed away. As an author, Mr. Pratt was one of the first to tackle on a comprehensive basis many railway problems of great public interest. His "Railways and their Rates" (1905), "Railways and Nationalisation" (1908), and "A History of Inland Transport of Communication in England" (1912), are especially notable. Many other books from his pen are truly monumental in character. They are recognised as standard works and both trained railwaymen and students owe much to Mr. Pratt for the care he took to render his writings complete and accurate. For many a year his works will have an honoured place on the railwayman's bookshelf.

THE LATE MR. A. LAMB, O.B.E.,

Assistant Superintendent of the Line, Great Northern Railway, 1920–1922.

* * *

Officers and members of the staff of the Great Eastern Railway, on October 27, at the Abercorn Rooms, Liverpool Street, Hotel, bade farewell to Sir Henry Thornton, General Manager, who is leaving shortly to take over control of the Canadian National Railway system. Sir Henry was accompanied by Lady and Miss Thornton. They were all the recipients of gifts subscribed for by members of the Great Eastern Railway staff, and Sir Henry was afterwards presented with the Gold Medallion of the National Union of Railwaymen by Mr. J. H. Thomas, who said Sir Henry had proved himself to be one of the best general railway managers this country had ever known.

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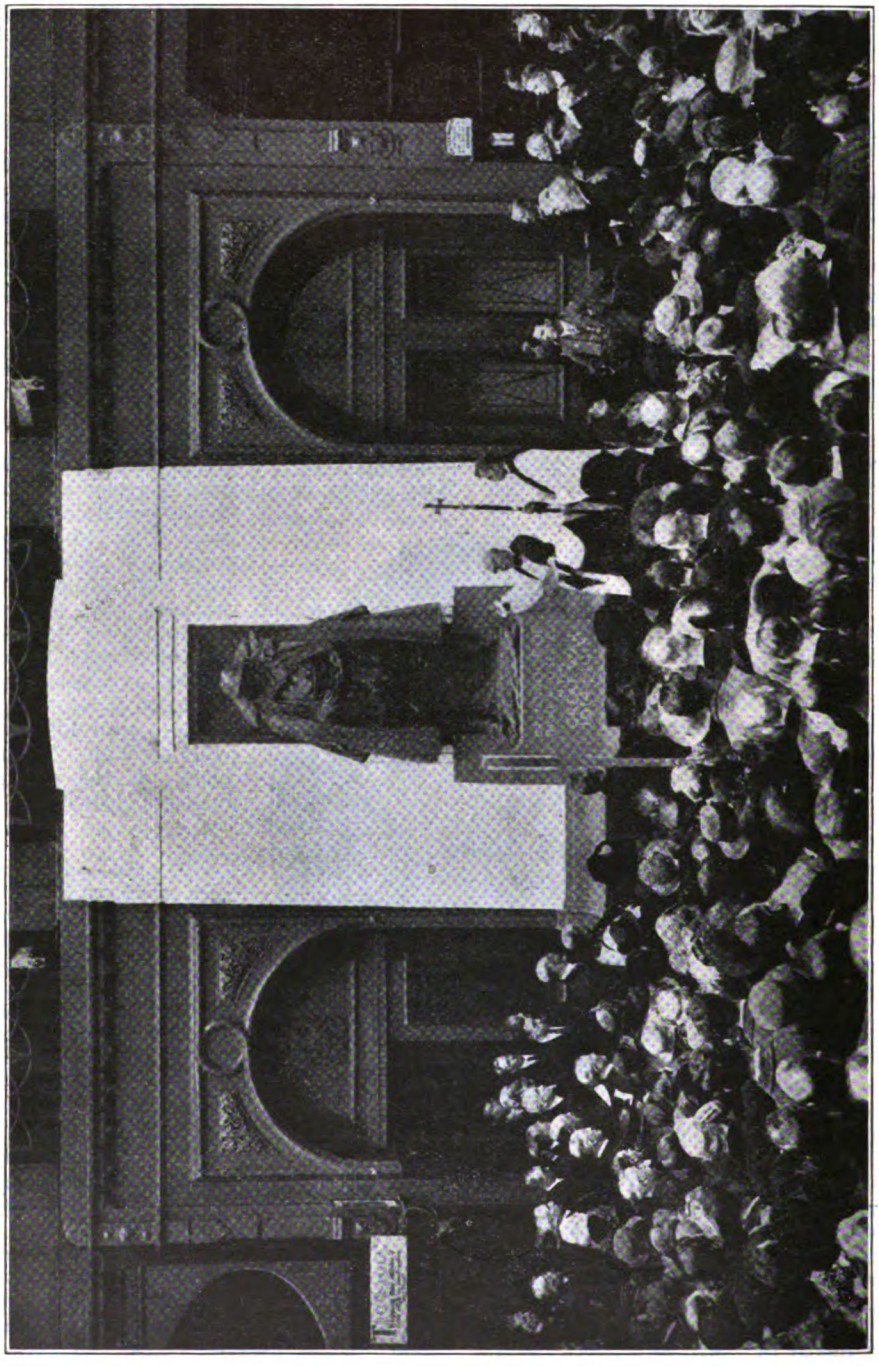

GREAT WESTERN RAILWAY WAR MEMORIAL.

Dedication at Paddington Station by His Grace the Archbishop of Canterbury, on Armistice Day, November 11, 1922.

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WHEN presiding on the last occasion during his chairmanship of the Great Eastern Railway, at the concert of the Great Eastern Railway Musical Society, in the Hamilton Hall, Liverpool Street, on November 1, Lord Claud Hamilton was presented with an oak mallet bearing a silver plate suitably inscribed. In returning thanks Lord Claud said that though it was the last time (officially, at least) he would preside, he trusted they would often invite him as their guest. He hoped sincerely that in the grouping which was about to take place, the Great Eastern Railway Musical Society would always hold its own. Referring to Sir Henry Thornton, he remarked that although the appointment to be their General Manager was severely criticised at the time, during the war His Majesty's Government were glad to avail themselves of Sir Henry's services, and now the Canadian Government had called upon him. "He goes from the 1,100 miles of the Great Eastern Railway to the 22,000 miles of the Canadian National Railways, under the British Ensign and not the Stars and Stripes. . . . If ever Sir Henry and Lady Thornton revisit us they will receive a hearty and sincere welcome." Sir Henry Thornton, in a happy speech, thanked Lord Claud and all present for their kind and appreciative remarks. He owed more to Lord Claud than to anyone else. The Musical Society had done much to promote not only that harmony which is pleasing to the ear, but also that harmony which promotes *esprit de corps*. He hoped to be able to transfer some of the "harmony" found on the Great Eastern Railway to the Canadian National system. Colonel Galloway added a few words, thanking Lord Claud and Sir Henry but declining to accept from the former "'that this is the last time when I will preside' . . . You were our first President, and I hope that as long as you live you will continue to honour us."

* * *

ARMISTICE DAY, 1922, will long be remembered at Paddington station by reason of the unveiling of the war memorial in honour of those Great Western railwaymen who served in the great war, 1914-1918. They were a great company, for 25,479 of the Great Western staff joined His Majesty's forces and 2,524 of them gave their lives. The memorial occupies a site beneath the centre transept of the station immediately in front of the Royal waiting room. It takes the form of a bronze figure of a soldier, executed by Mr. C. S. Jagger, R.B.S. The unveiling was performed by the Rt. Hon. Viscount Churchill, G.C.V.O., Chairman of the company, and it was dedicated by His Grace the Archbishop of Canterbury.

* * *

CONSPICUOUSLY placed at the eastern entrance of the Barry Railway offices is the recently unveiled marble tablet erected to the memory of 65 Barry railway employees who made the supreme sacrifice during the Great War. After the dedication of the memorial, the Earl of Plymouth addressed the assembly, and said the total number of the company's servants who served with the forces was 824, and of those 65 had lost their lives. Some who returned had since died, but their names were honoured equally with those whose names appeared on the tablet. When the tablet was first designed the Barry Railway was a separate concern, but now, as they knew, it formed part of the Great Western Railway. They deeply appreciated the presence of Lord Churchill, Chairman of the Great Western Railway, and of Mr. Pole, the General Manager, who had travelled specially from London, thereby proving their interest, not only in the future, but also in the past history of the Barry Railway.

* * *

OWING to the operation of the Railways Act, 1921, and the consequent grouping of British railways the office staffs are looking forward to great changes in the organisation of railway work and are wondering how they will be affected both individually and collectively. The older men, near to superannuation age, are not over troubled by the prospect of change, but many of the younger ones are on the alert to find out what is the best course to adopt in order to conserve their present positions in the railway industry and to advance to better ones in the future. The really clever and deserving young railwaymen are those who are determined that whatever happens under the grouping system they will not "be left." In order to safeguard their prospects such as these are busily expending all the spare time they can afford in acquiring knowledge that will fit them for posts superior to the ones they at present occupy. Ambitious young men, whether in the railway service or outside it, may be recommended to try the advantages of the college system of coaching, such as that in vogue at the Metropolitan College, St. Albans, Herts. The teaching is all done through the post, but by enrolling with the Metropolitan College the aspirant becomes a member of a business university, the members of which outnumber the combined colleges of Oxford or Cambridge. For the

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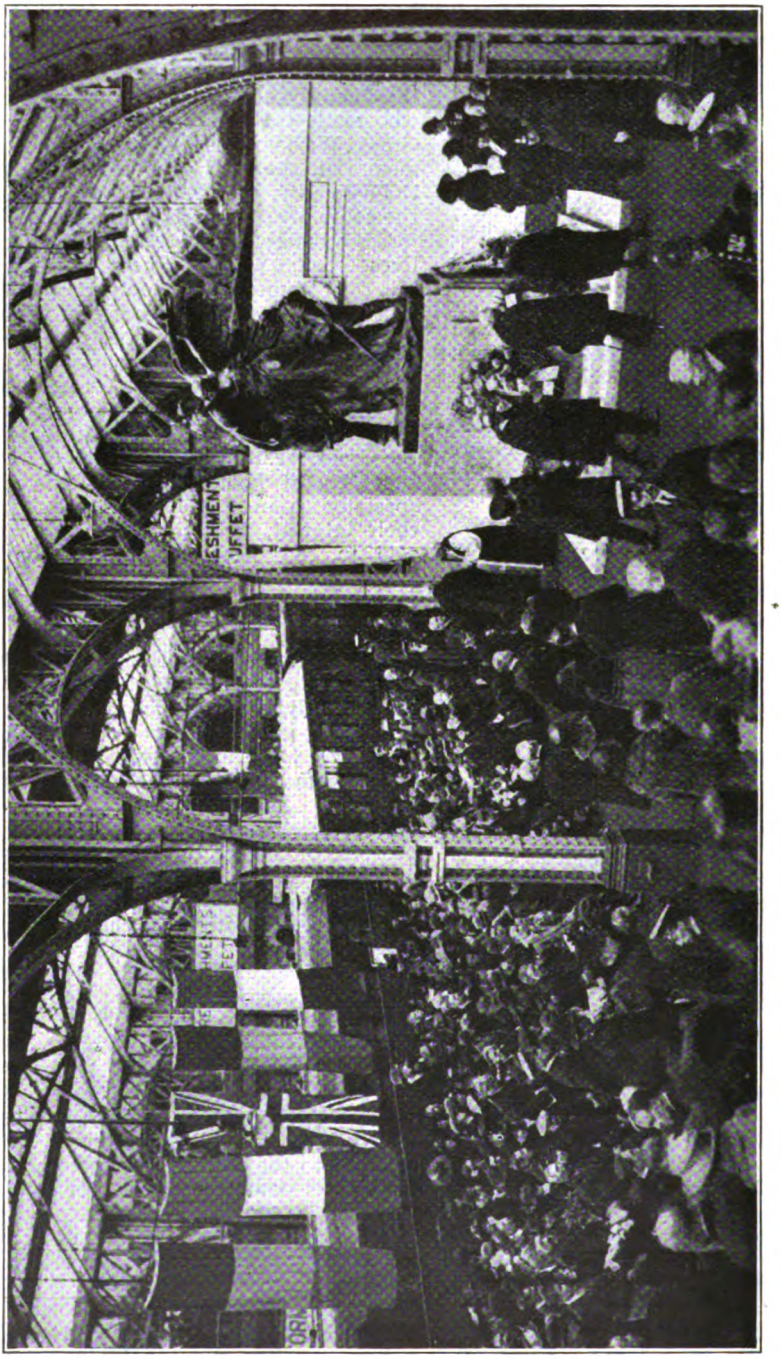

SOUTH EASTERN AND CHATHAM RAILWAY WAR MEMORIAL AT DOVER MARINE STATION.

Directors passing the Memorial after the Unveiling.

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use of persons interested the Metropolitan College has just issued an admirable guide entitled "Careers in Secretaryship, Accountancy, Insurance, Banking and Commerce." This is a well-produced publication that throws valuable light upon all that appertains to the college and its methods; in short, it tells exactly what it is, its proposals and its possibilities. The guide will be sent post paid and "free to keep" to all RAILWAY MAGAZINE readers who write to the Metropolitan College, St. Albans, for copies.

* * *

DIGNIFIED, simple and impressive was the ceremony observed at the recent unveiling of the South Eastern and Chatham Railway's War Memorial at Dover Marine station. As the Bishop of Dover pointed out in his address, the South Eastern and Chatham Railway is inseparably associated in most peoples' minds with Continental travel, and in the great war Dover was a vitally important point. No fewer than 4,000 hospital ships arrived there, and hospital trains were despatched to all parts of Great Britain. Essentially a civilian's war, it was appropriate that the unveiling ceremony should be performed by the chairman of the company, and Mr. H. Cosmo Bonsor's heartfelt address was singularly appropriate. Before the individual tributes of remembrance were laid at the foot of the memorial, wreaths were deposited by Mr. H. C. O. Bonsor on behalf of the directors, and Mr. P. C. Tempest on behalf of the staff. Then followed floral tributes from the St. John Ambulance Association, the National Union of Railwaymen, and the Railway Clerks' Association. A particularly pleasing incident was the unexpected arrival of a special messenger bearing a wreath from the General Manager and staff of the Northern Railway of France in remembrance of the 556 South Eastern and Chatham railwaymen who gave their lives in the Great War.

* * *

ON the London "Underground" electric system of railways a scheme of reductions in fares is to become operative on Monday, January 1, although the initial 1½d. fare is to be retained. Above 1½d. the fares will be reduced to an approximate rate of 1d. per mile up to 4d. and thereafter to increase the distance given for all rates of fare above 4d. The workman's return fare will be the single ordinary fare for the double journey; so that where the ordinary fare is reduced the workman will get a corresponding reduction. The minimum return fare will remain 3d. Where season ticket rates have been based upon the present ordinary fares, in accordance with the scale commonly employed, they will be reduced to agree with the new ordinary fares. The scheme involves reductions in about 12,000 fares and to introduce it involves the reprinting of practically the whole of the tickets, which means printing upwards of one hundred million tickets!

* * *

FROM Electric Railway House, Westminster, has come a striking pictorial poster depicting the fashions prevailing "When granny was a girl." The artist is Austin Cooper. The poster advertises the fact that visitors to the London Museum will find the nearest "Underground" electric railway stations to be St. James' Park and Dover Street respectively. As lady friends of RAILWAY MAGAZINE readers well know, if the readers themselves do not, the exhibition of fashions of varying periods is one of the great attractions of the London Museum.

* * *

KNOWN principally as manufacturers of model railway wooden rolling-stock, the Forward Model Company, 31, Abbey Lane, Woodseats, Sheffield, have other specialties in hand for the Christmas and New Year season and these are made in solid metal, as will be seen by the firm's announcement in the RAILWAY MAGAZINE advertisement pages.

* * *

DECEMBER will see a greatly improved passenger service between London and Berlin via Harwich, when in addition to the existing daily service, a train-de-luxe will be run between the Hook of Holland and Berlin three times weekly in each direction. This train, which will be composed of sumptuously appointed first-class carriages and a restaurant car, will accomplish the journey in nearly 4 hours less than the ordinary daily train. The new train is to leave the Hook of Holland on Saturday, Tuesday and Thursday mornings, in connection with the 8.30 p.m. departure from Liverpool Street station the previous evening, arriving in Berlin at 5.21 p.m. (Mid-European time), that is to say less than 20 hours after the departure from London. At Berlin connections are made with expresses for Riga and Warsaw. The return from Berlin will be just after mid-day on Mondays, Wednesdays and Fridays, passengers arriving at Liverpool Street station at 9.30 the next morning. Taken in conjunction with the Pullman Continental expresses between Liverpool Street and Parkeston Quay, and the luxurious steamers of the Harwich route, the new "limited" offers to men of affairs a par-

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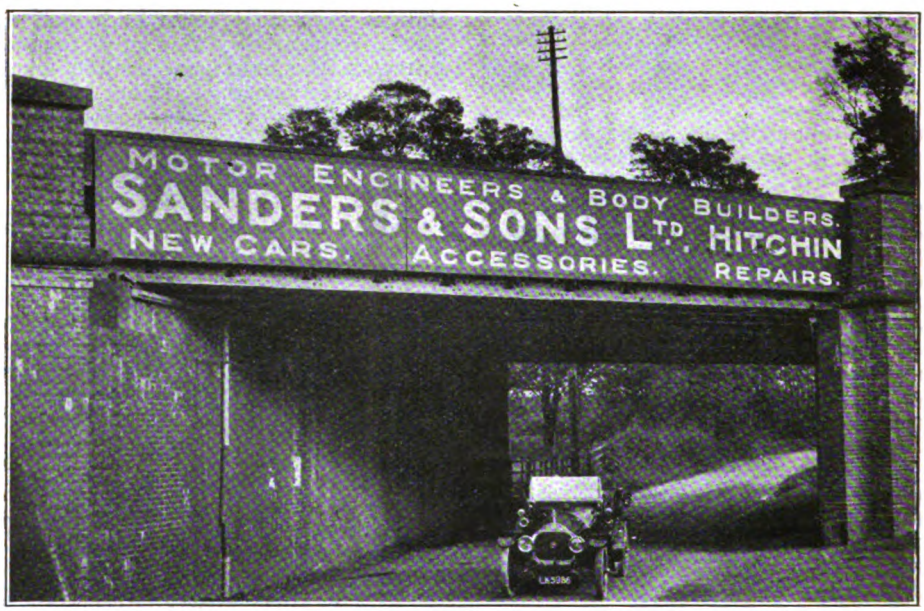
ticularly comfortable and expeditious mode of travel, especially as it has been arranged that passport and customs examinations at the Dutch-German frontier shall take place in the train. A supplementary charge for seats will be made according to the distance travelled, and reservations must be made in advance through the Great Eastern Railway Company.

* * *

FROM November 3, a through express train first and second-class, has run from Calais daily to Cannes, Nice, Monte Carlo, Mentone, Ventimiglia, &c., in connection with the 11 a.m. service from Victoria. In addition to first and second-class corridor carriages in which seats can be reserved at Victoria (South Eastern and Chatham Railway), the through train has a sleeping-car of the International Wagons-lits Company and a Voiture de Luxe containing compartments of lits-salons, with and without bedding, and couchettes. A restaurant car accompanies the train on its entire journey from Calais to Ventimiglia. The Calais-Mediterranean express running from Calais daily on and from November 18 in connection with the 11 a.m. service from Victoria, and will this winter be composed entirely of new stock built in England. The winter sports service to Switzerland, via Dover-Calais and Laon, will run daily for the season from December 15. Those travelling to Switzerland before that date are advised to make use of the new Calais-Bâle carriage, via Lille, Hirson and Strasbourg, which runs daily in connection with the 11 a.m. service from Victoria. The Dover-Ostend and Folkestone-Flushing services will run throughout the winter, on Sundays as well as on week-days, and the latter service not only provides the quickest communication between London and Cologne, but, on the return journey, arrives at Victoria at the convenient hour of 9.5 p.m., instead of the somewhat late summer service time of 10.5 p.m.



GREAT NORTHERN RAILWAY OVER-ROAD BRIDGES ARE MADE REVENUE RAISERS BY THE ADVERTISEMENTS THEY CARRY.

ON this page is illustrated a Great Northern Railway bridge by which the main line is carried over the public road, midway between Stevenage and Hitchin. The photograph reproduced demonstrates how the Great Northern Railway Company is securing additional revenue in allowing advertisements to be fixed to their over-road bridges, and in this case it will be seen they have shrewdly turned to account the fact that the railway has its roadway competitors.

* * *

IN connection with the Christmas and New Year holiday periods, excursion trains at single fare and a third for the double journey will be arranged on all main routes, providing for outward journeys on Friday,

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December 22, returning on the Tuesday, Wednesday or Saturday of the following week or on Friday, January 5; and on Saturday, December 23, available for return on Tuesday, Wednesday or Saturday of the following week, or on Saturday, January 6. In the case of Scotland, the outward trains from London will run on Friday, December 22, returning the following Tuesday or Wednesday, or on Fridays, December 29 or January 5. For the New Year, outward trains will be provided on Friday and Saturday, December 29 and 30, for return on Tuesday or Friday, January 2 or 5. To Ireland, outward facilities will be given on Friday, December 22, and from Ireland to England on Thursday and Friday, December 21 and 22, in each case permitting of return at any time within 15 days. Both from and to most of the principal provincial towns corresponding excursion facilities will be provided. An important development is that the usual week-end bookings over the Christmas period will be available by any train after 5.0 p.m. on Friday, December 22, and by any train on Saturday, December 23, and will be available for return not only on the following Sunday or Monday but also on Tuesday, December 26. Correspondingly, for the New Year period ordinary week-end tickets will be available for return on Tuesday, January 2, as well as on the Sunday or Monday preceding. A large number of excursions will be run on Boxing Day, providing for return in 1, 2, 3 or 5 days.

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WE are informed that second-class accommodation will be discontinued on the Manchester, South Junction and Altrincham Railway as from January 1, 1923. This line is worked jointly by the Great Central and the London and North Western Companies, but has had special rolling-stock allocated thereto.

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IN these days of steam-heated trains and comfortable travel the taking of holidays in the winter is not the problem it was a generation ago and to cater for the growing habit the "Holiday Fellowship, Ltd.," is keeping open, not only its headquarters, "Bryn Corach," Conway, but also its guest house, "Broomhill," at Newlands near Keswick and its bungalow guest house at Swanage. These guest houses are very popular at Christmas and New Year, and RAILWAY MAGAZINE readers who desire to avail themselves of the advantages offered should make early application to the secretary at "Bryn Corach," Conway. All three guest houses are easily accessible to railway travellers and each one offers a charming holiday home among pleasant surroundings at very low cost. A circular describing the guest houses will be sent by the secretary on receipt of a stamped and addressed envelope.

* * *

AT the Railway Club headquarters, 65, Belgrave Road, S.W.1, on November 10, Mr. H. Gordon Tidey gave an excellent address on "Railway Photography" and on Friday, December 8, Mr. C. H. Palmer will, at 7.30 p.m., lecture on "Railways of Germany and Central Europe." On Friday, December 15, there will be a gathering at 7 p.m. at the Feathers Hotel, Broadway, Westminster, S.W.1 (near St. James' Park station) for the sixteenth annual dinner. The club has acquired an interesting relic of the broad gauge, consisting of the six-page pamphlet issued by the Great Western Railway in May, 1892, detailing the train arrangements in connection with the conversion of gauge between Exeter and Truro. The pamphlet has been placed in a reversible glazed frame and allotted a suitable position in the Club room. Applicants for membership should send a stamped and addressed envelope to the Hon. Secretary at the headquarters above mentioned.

* * *

CHEAP half-day tickets which were put into operation on Wednesday afternoons during the summer, from Uxbridge Line stations, Uxbridge, Ruislip and Eastcote, to Metropolitan District Railway stations, Ealing Common, Hammersmith, High Street, Kensington, Earl's Court, Victoria and Charing Cross, by the route via South Harrow, will continue to be issued during the winter months. These tickets are issued by the 1.30 p.m. special train from Uxbridge; also by the 2.6 p.m. ordinary train. The return journey may be made by any train after 6 p.m.

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DURING Easter and the summer season of 1922, 115,520 pleasure party passengers were carried on the London Electric Underground Railways. The passengers mainly comprised those attached to football, cricket and sports clubs, beanfeasts, school outings, and the like.

* * *

VALUABLE tests were carried out recently in the speed of booking tickets on the London Underground, and some wonderful records were made. At Piccadilly Circus station between 5.30 p.m. and 6.30 p.m., the booking clerk issued by hand the prodigious number of 809 tickets in 60 minutes; 441 passengers during the test required change as follows: 9 passengers required ½d. change, 3 required change for 3d, 157 for 6d., 130 for 1s., 85 for 2s., 61 for 2s. 6d., and 6 for 10s. At Oxford

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Circus station by means of the new electrically operated booking machine, between 5.30 p.m. and 6.30 p.m. the booking clerk issued 872 tickets. During that time he was delayed in answering four enquiries for season tickets, and in supplying from the emergency ticket rack six ordinary tickets which the machine was unable to meet.

* * *

THE London, Brighton and South Coast Railway has several lantern lectures which they lend out for exhibition purposes. Two new sets have just been completed illustrating Rambles on the South Downs. The first set covers the ground between Pevensey and Lewes, and the second between Lewes and Chichester. The slides and lectures have been arranged by Mr. Arthur H. Page, of the Royal Photographic Society, and many of the slides have gained high honours at the various photographic exhibitions. Other lantern lectures illustrate a visit to Dieppe, Rouen and Paris; A Holiday in Switzerland; The Italian Lakes and Dolomites; journeys to Hastings, Bexhill and Eastbourne, Portsmouth and the Isle of Wight; also Worthing and Brighton. Applications for the above should be addressed to the Publicity Department, London, Brighton and South Coast Railway, London Bridge, S.E. 1.

* * *

WRITING from Crewe, Mr. C. Williams states that the final series of 0-8-0 superheater goods engines ("G 2" class) is now being turned out at the London and North Western Railway works as follows: Nos. 758, 1012, 2414, 2429, 2517, 231, 308, 403, 2178, and 13 (Crewe Nos. 5712-21). Of these No. 758 is stationed at Willesden (2 shed) and No. 1012 at Rugby (8 shed). He adds that No. 13 *Vindictive* ("Claughton" class) has been renumbered 2430, and is now replaced by one of the new superheater goods mentioned above. No. 1737 *Viscount* ("Precursor" class ordinary) and No. 1309 *Shamrock* ("Precursor" class superheater) have been converted to "George the Fifth" class, while No. 1950 *Victorious* ("Alfred the Great" class compound) has been converted to two-cylinder simple "Renown" class. One of the special tank shunting engines, No. 3092, has been fitted with a new smokebox of the ordinary pattern, in place of that of the old Ramsbottom type with sloping front. The following engines have been withdrawn for scrapping: No. 308 *Booth*, No. 403 *Isabella*, No. 1189 *Stewart* and No. 2178 *Pluck* ("Precedent" class); No. 231 *Firefly* ("Waterloo" class), No. 2517 (2-4-2 tank) and No. 1012 (0-6-2 tank).

THE 2-4-0 side tank locomotives of the Great Western Railway continue to fill many spheres of usefulness. In addition to running the inspector's saloon in the Bristol district, and working various local services, they are frequently seen on heavier duties. The (Mondays only) 8.5 a.m. from Bath to Bristol is generally worked by one of these locomotives, which one morning recently was hauling seven bogie vehicles.

* * *

"C.S.L." writes: I have not noticed any reference in the RAILWAY MAGAZINE, in dealing with fast start to stop runs, to the scheduled timings of certain trains on the London and North Western Railway between Birmingham and Coventry. The distance between New Street, Birmingham and Coventry Station is given by Bradshaw as 19 miles, and by the London and North Western Railway officially as 18¾ miles. Certain of the trains, as for instance those leaving New Street at 1.0 p.m. and 6.20 p.m. are timed to cover the distance in 19 minutes, and on the two occasions on which I have travelled by these trains recently time has been kept. This is approximately a 60 m.p.h. average, and, as those knowing the district will agree, both the start from Birmingham and the approach to Coventry platform are anything but ideal for saving seconds when timings of this sort are involved. The 6.20 p.m. is certainly a heavy train as between Birmingham and Coventry, passengers for the latter place being directed to the rear coaches and London passengers in front. On a recent occasion this train left New Street 15 seconds late and arrived at Coventry on time, so that even though the shorter mileage, namely, 18¾ miles, is the correct one, it would mean exactly 60 m.p.h. as an average.

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RAILWAY MAGAZINE readers who engage in model making inquire frequently where drawings of railway locomotives and rolling-stock may be obtained. We have pleasure in mentioning that Edwards Brothers, 7, Fairoak Road, Roath Park, Cardiff, are specialists in this direction, and, among other things, they have just put on the market a set of drawings from which a model East Coast Express Train may be built.

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RAILWAY MAGAZINE readers include many a one to whom an absolutely reliable watch is a prime necessity. Mr. R. M. Mercer, 29, Warwick Row, Coventry, is a specialist in railway watchmaking, and he will do his utmost to meet the requirements of the railway staff and others who write to him and mention this periodical.

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